NEC

User's Manual

78K0/Lx3 - See it!

Demonstration Kit for the 78K0 L_Series

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EEDT-ST-005-10

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Date	Revision	Chapter	Description
21-06-2007	V1.00	---	First release
20-07-2007	V2.00	5, 7, 8, 9	Changed description from FPL3 to WriteEZ3 FLASH programming software

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1. Introduction

78K0/Lx3 - See it! is a demonstration kit for the 78K0 L_Series 8-bit microcontrollers with integrated LCD controller. It supports On-Board debugging, FLASH programming and real time execution of application programs based on the 78K0/LF3 microcontroller. The board is prepared to be connected to user hardware parts such as digital I/O or analogue signals.

1.1 Main features of *78K0/Lx3 - See it!*

- Easy to use device demonstration capabilities
  78K0/Lx3 - See it! contains elements to easily demonstrate simple I/O-functions, i.e. navigator switch, 224 segment LCD panel, temperature sensor, IR receiver module, I/O lines, UART serial interface etc.

- TK-78 debugging
  The *78K0/Lx3 – See it!* supports an On-Board debug function by using the IAR C-SPY debugger and the UART / USB interface without a need of additional debug hardware. It allows FLASH programming and supports standard debug functions i.e. code execution, single stepping, software breakpoints, memory manipulation etc.

- OCD debugging
  The *78K0/Lx3 – See it!* is prepared to be equipped with a 10-pin connector in order to connect the QB-MINI2 On-Chip debug emulator to use the On-Chip debug function of the 78K0/LF3 device. Please note, the QB-MINI2 is separate product from NEC and it is not included in this starterkit package.

- Flexible power supply
  The *78K0/Lx3 - See it!* supports a flexible configuration of it's power supply. The board can be powered by the USB interface, the QB-MINI2 On-Chip debug emulator as well by an external power supply.

- LCD panel
  78K0/Lx3 - See it! provides a 224 segment LCD panel, allowing the implementation of human / machine interface, comfortable input / output functions, output of measurement values, output of status information etc.

- WriteEZ3, FLASH programming software
  A windows based FLASH programming software allows to select and download application programs to the *78K0/Lx3 - See it!* board for evaluation purposes.

- Various input / output signals available, such as

  - I/O ports prepared to be connected to user hardware
  - 224 segment LCD panel
  - Timer input / output signals
  - Two or three wire serial I/O
  - UART interface, via USB UART chip FT232
  - Eight channel 10-bit A/D converter
  - Three channel 16-bit ΔΣ A/D converter
  - IR receiver module RPM7138
  - Temperature sensor S-8120C
  - Navigation switch prepared for key interrupt generation

- The IAR Embedded Workbench for 78K and the IAR C-SPY debugger / simulator are included. This package is restricted in such that maximum program code size is limited to 4 kByte of program code.

- Full documentation is included for the 78K0/LF3 microcontroller, IAR Systems Embedded Workbench, IAR Systems C-SPY debugger / simulator and the WriteEZ3 FLASH programming software

CAUTION

The 78K0/Lx3 - See it! starterkit is not intended for code development. NEC does not allow and does not support in any way any attempt to use 78K0/Lx3 - See it! in a commercial or technical product.

1.2 System requirements

HOST PC

A PC supporting Windows 98SE, Windows ME, Windows 2000 or Windows XP is required for the IAR Systems Embedded Workbench demo-version and the WriteEZ3 FLASH programming software. Pentium 166 MHz (at least), 128 MB of RAM, 256-color display (1024 * 768), mouse, CD-ROM drive and 200 Mbytes of free hard disk space are required to install the tool packages.

Above listed requirements are valid for the IAR Systems Embedded Workbench and the WriteEZ3 FLASH programming software.

Host interface

USB interface that enables communication based on USB (Ver1.1 or later)

1.3 Package contents

Please verify that you have received all parts listed in the package contents list attached to the *78K0/Lx3 - See it!* package. If any part is missing or seems to be damaged, please contact the dealer from whom you received your *78K0/Lx3 - See it!*.

Note: Updates of the IAR Embedded Workbench for 78K, FP3 FLASH programming software, documentation and/or utilities for *78K0/Lx3 - See it!*, if available, may be downloaded from the NEC WEB page(s) at **http://www.eu.necel.com/updates**

1.4 Trademarks

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2. *78K0/Lx3 - See it!* system configuration

The *78K0/Lx3 - See it!* system configuration is given in the diagram below:

Figure 1: *78K0/Lx3 - See it!* system configuration

2.1 78K0/Lx3 - See it!

78K0/Lx3 - See it! is a demonstration kit for the 78K0/LF3 8-Bit microcontroller with integrated LCD controller. The *78K0/Lx3 - See it!* board is connected to the host system via USB interface cable. The host system may be used for onboard FLASH programming of the 78K0/LF3 internal FLASH memory and to allow execution of application programs on *78K0/Lx3 - See it!* starterkit. Additionally it supports On-Chip debug functionality by using the IAR C-SPY debugger.

78K0/Lx3 - See it! runs the microcontroller at 8.0000 MHz operating speed. Per default the internal high-speed oscillator of the 78K0/LF3 device is used. The Sub-clock is provided with 32.768 kHz.

2.2 Host computer

The USB host interface enables communication to the *78K0/Lx3 - See it!* board. The USB UART chip FT232 allows application software to access the USB device in the same way as it would access a standard RS232 interface. The FTDI's Virtual COM Port (VCP) driver appears to the windows system as an extra Com Port, in addition to any existing hardware Com Ports.

2.3 Power supply via USB interface

The *78K0/Lx3 - See it!* supports a flexible configuration of it's power supply. The board can be powered by the USB interface, the QB-MINI2 On-Chip debug emulator as well by an external power supply.

3. *78K0/Lx3 - See it!* components

The *78K0/Lx3 - See it!* board is equipped with a navigation switch, a 224 segment LCD panel, temperature sensor and with several connectors in order to be connected to host computers, FLASH programmer or any external target hardware.

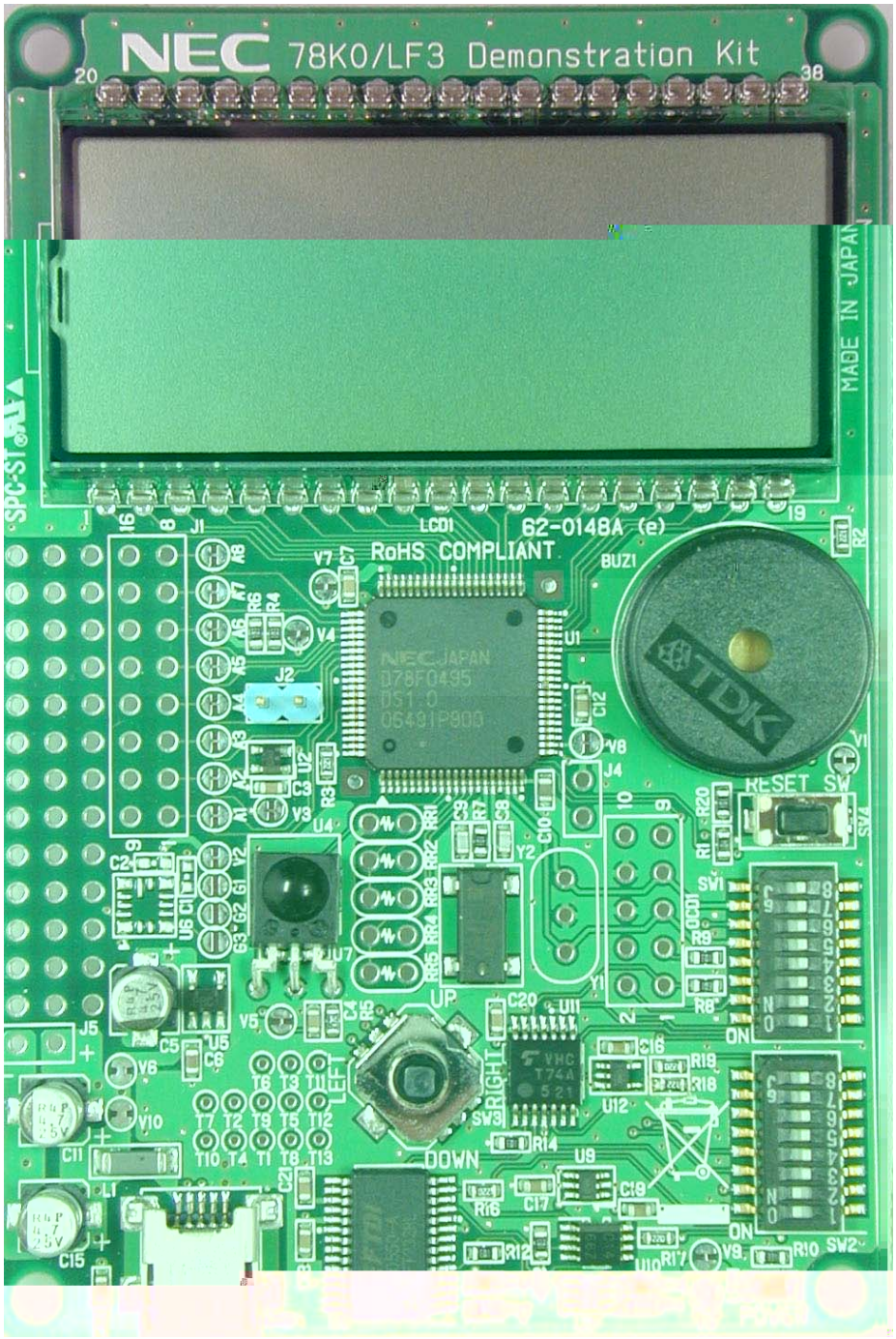


Figure 2: *78K0/Lx3 - See it!* board connectors and switches, top view

Some of the *78K0/Lx3 - See it!* components are free for user application hardware and software. Please read the user's manual of the 78K0/LF3 device carefully to get information about the electrical specification of the available I/O ports before you connect any external signals to the *78K0/Lx3 - See it!* board.

3.1 Configuration switches SW1 / SW2

The different operation modes of the *78K0/Lx3 - See it!* board can be set by switches SW1 and SW2.

Mode	SW2								SW1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
On-Board Debug	ON	ON			don't care				ON	ON	ON	ON	ON	ON		
			OFF	OFF											OFF	OFF
FPL3 (WriteEZ3)			ON	ON	don't care				ON	ON					ON	ON
	OFF	OFF									OFF	OFF	OFF	OFF		
QB-MINI2	ON	ON			don't care											
			OFF	OFF					OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Table 1: Operation mode selection SW1 / SW2

3.1.1 On-Board Debug Mode (TK-78 debugging)

Within this mode On-Board debugging is enabled. By using this mode no additional debug hardware like the QB-MINI2 On-Chip debug emulator is needed. The debugging is done via the default USB/UART connection to the Host computer. All standard debug function are available in the On-Board debug mode like FLASH programming / downloading, code execution, single stepping, breakpoints, memory manipulation etc.

3.1.2 FPL3(WriteEZ3) Mode (FLASH programming mode)

This mode allows to reprogram the internal FLASH memory of the 78K0/LF3 device by using the WriteEZ3 FLASH programming software. Within this mode FLASH programming is done by using the default USB/UART connection to the Host computer.

3.1.3 QB-MINI2 Mode (OCD debugging / Normal execution mode)

Within this mode the QB-MINI2 On-Chip debug emulator can be connected to the *78K0/Lx3 - See it!* board in order to use On-Chip debug function of the 78K0/LF3 device.

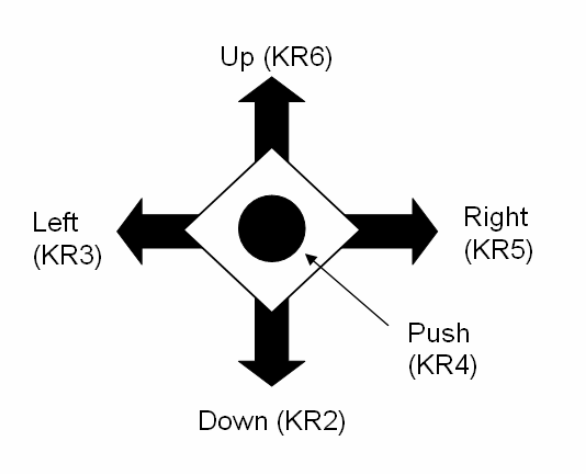
Additional, when no QB-MINI2 On-Chip debug emulator is connected to the *78K0/Lx3 - See it!* board the 78K0/LF3 device starts within normal execution mode and the user program stored in the FLASH memory is executed.

3.2 RESET button, SW4

SW4 is the reset button. It activates the power on reset. It is connected to the reset input of the 78K0/LF3 microcontroller.

3.3 Navigation switch, SW3

Button SW3 is a navigation switch connected to the key interrupt port of the 78K0/LF3 device. It operates in five directions including a center push function. The connection of SW3 is shown in the table below:



SW3	Connection to the 78K0/LF3 device
Left	P43/KR3
Down	P42/KR2
Push	P44/KR4
Right	P45/KR5
Up	P46/KR6

Table 2: Navigation switch SW3

3.4 External A/D measurement inputs, connector J1

Connector J1 can be configured to measure external analogue signals by using the internal 10-Bit A/D converter or respectively the 16-bit ΔΣ A/D converter of the 78K0/LF3 device. To use this mode please open the corresponding soldering bridges A1 - A8.

J1	Signal	J1	Signal
1	P20/ANI0/DS0-	9	GND
2	P21/ANI1/DS0+	10	GND
3	P22/ANI2/DS1-	11	GND
4	P23/ANI3/DS1+	12	GND
5	P24/ANI4/DS2-	13	GND
6	P25/ANI5/DS2+	14	GND
7	P26/ANI6/REF-	15	GND
8	P27/ANI7/REF+	16	GND

Table 3: External A/D measurement inputs, connector J1

3.5 External A/D measurement input, connector J2

Connector J2 can be used to measure an external analogue signal by using the internal 10-Bit A/D converter or respectively the 16-bit ΔΣ A/D converter of the 78K0/LF3 device.

J2	Signal
1	P23/ANI3/DS1+
2	GND

Table 4: External A/D measurement input, connector J2

3.6 IDD measurement, connector J4

Connector J4 (not assembled) can be used to measure the current consumption of the 78K0/LF3 device. For using this mode please open soldering bridge V8.

3.7 External power supply input, connector J5

By using connector J5 (not assembled) external power supply can be applied to the *78K0/Lx3 - See it!* board without a need of an active USB connection.

J5	Input
1	VDD (+5V)
2	GND

Table 5: External power supply input, J3

Note: Be sure to unplug the USB connection before applying external power supply to input J5.

3.8 External main oscillator, Y1

The clock generator of the 78K0/LF3 device can be configured to work with an external oscillator connected to the X1 and X2 pins. To use this mode equip pad Y1 of the *78K0/Lx3 - See it!* board with an corresponding oscillator. The configuration of the clock generator is described within the user's manual of the 78K0/LF3 device.

3.9 QB-MINI2 connector, OCD1

Connector OCD1 (not assembled) allows connecting the QB-MINI2 On-Chip debug emulator to the *78K0/Lx3 - See it!* board in order to use On-Chip debug function of the 78K0/LF3 device. Please note, QB-MINI2 is a separate product from NEC and it is not included in this starterkit package.

OCD1	Signal
1	RESET_IN
2	RESET_OUT
3	FLMDO
4	VDD_IN
5	X2
6	GND
7	X1
8	GND
9	not connected
10	VDD

Table 6: QB-MINI2 connector OCD1

When using QB-MINI2 for debugging purpose, please configure switch SW2 of the *78K0/Lx3 - See it!* board as following:

Mode	SW2								SW1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
QB-MINI2	ON	ON			don't care											
			OFF	OFF					OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Table 7: Configuration of SW1 and SW2 when using QB-MINI2

For more details on how to configure *78K0/Lx3 - See it!* in order to use On-Chip debugging please refer to **CHAPTER 4, ON-CHIP DEBUGGING**.

3.10 USB interface connector, USB1

This interface allows connecting the IAR C-SPY debugger to the *78K0/Lx3 - See it!* board in order to use the On-Board debug function (TK-78 debugging). The TK-78 interface supports On-board FLASH programming and standard debug features like code execution, single stepping, breakpoints, memory manipulation etc.

Additional the WriteEZ3 FLASH programming software uses the USB communication channel to program application software into the CPU internal flash memory.

The power supply of the *78K0/Lx3 - See it!* board is also provided by the USB1 connector.

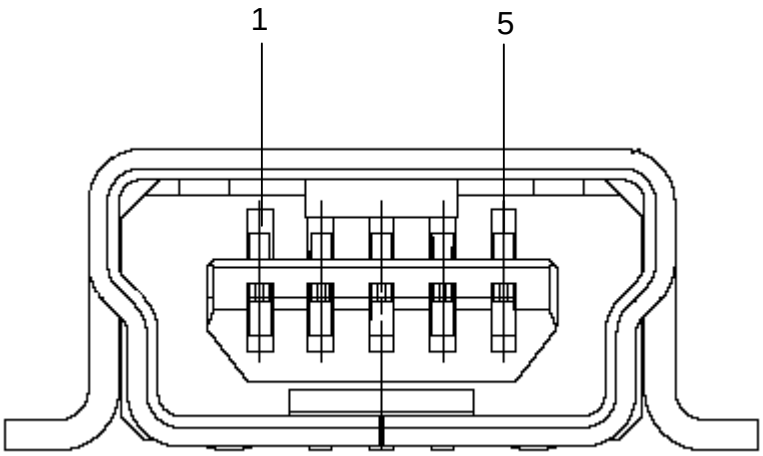


Figure 3: Connector USB1, USB Mini-B Type Host Connector Pin Configuration

Connector USB1	Signal Name
1	VBUS
2	D-
3	D+
4	not connected
5	GND

Table 8: Pin Configuration of Connector USB1

For connection with the host machine, use a USB cable (Mini-B type). For confirmation, NEC Electronics used only the USB cable delivered with the *78K0/Lx3 - See it!* board.

3.11 LCD1, 224 segment LCD panel

The *78K0/Lx3 - See it!* board is equipped with a 224 segment LCD panel. The LCD is a transflective model type operating at 5V supply voltage. It can operate at a eight times multiplex rate. The LCD driver specification is as following:

LCD driver specification	Mode
Driver voltage generation	Internal resistance division
Bias method	1/4
Timesharing	8
Common signals	8 (COM0-COM7)
Segment number	28 (SEG4-SEG31)
Number of maximum display pixels	224 (28 segments × 8 common)

Table 9: LCD driver specification

The LCD is divided into a character and indicator field. The character field is composed of six 5x7 DOT matrix characters. The indicator field includes a set of predefined symbols, for instance weekday, battery and antenna symbols. The outline of the LCD and the corresponding segment assignment is shown below.

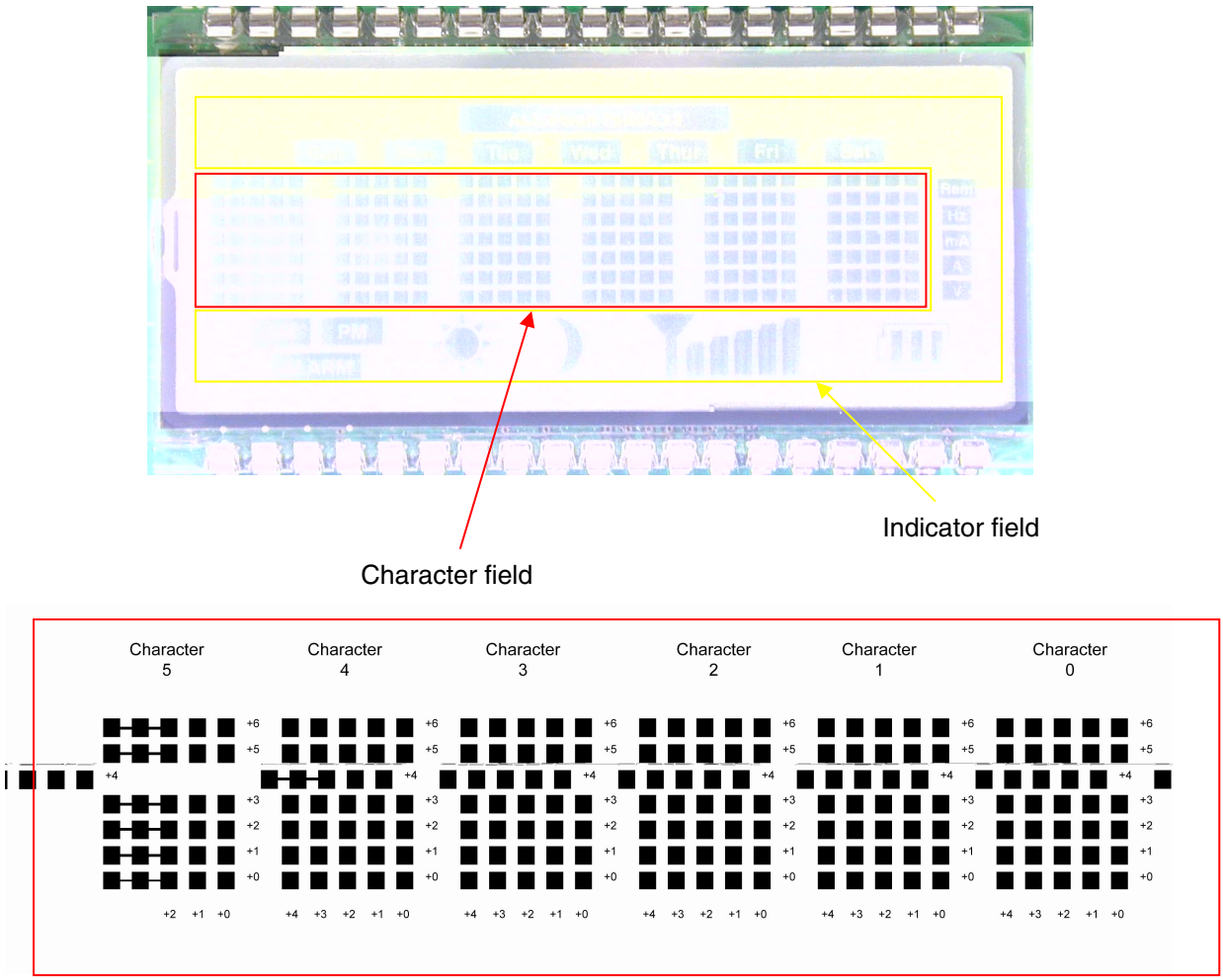


Figure 4: LCD outline

Bit position	LCD RAM address							
	+27	+26	+25	+24	+23	+22	+21	+20
bit7	ALARM	AM	PM	Sun	MOON (symbol)	SUN (symbol)	Mon	All FLASH 78K0/Lx3
bit6	520	510	500	440	430	420	410	400
bit5	521	511	501	441	431	421	411	401
bit4	522	512	502	442	432	422	412	402
bit3	523	513	503	443	433	423	413	403
bit2	524	514	504	444	434	424	414	404
bit1	525	515	505	445	435	425	415	405
bit0	526	516	506	446	436	426	416	406

Bit position	LCD RAM address									
	+19	+18	+17	+16	+15	+14	+13	+12	+11	+10
bit7	Tue	Wed	Thur	Fri	Sat	V	A	mA	Hz	Rem
bit6	340	330	320	310	300	000	010	020	030	040
bit5	341	331	321	311	301	001	011	021	031	041
bit4	342	332	322	312	302	002	012	022	032	042
bit3	343	333	323	313	303	003	013	023	033	043
bit2	344	334	324	314	304	004	014	024	034	044
bit1	345	335	325	315	305	005	015	025	035	045
bit0	346	336	326	316	306	006	016	026	036	046

Bit position	LCD RAM address									
	+9	+8	+7	+6	+5	+4	+3	+2	+1	+0
bit7	Bt3 (Battery)	Bt2	Bt1	BtM	An5 (Antenna)	An4	An3	An2	An1	AnM
bit6	100	110	120	130	140	200	210	220	230	240
bit5	101	111	121	131	141	201	211	221	231	241
bit4	102	112	122	132	142	202	212	222	232	242
bit3	103	113	123	133	143	203	213	223	233	243
bit2	104	114	124	134	144	204	214	224	234	244
bit1	105	115	125	135	145	205	215	225	235	245
bit0	106	116	126	136	146	206	216	226	236	246

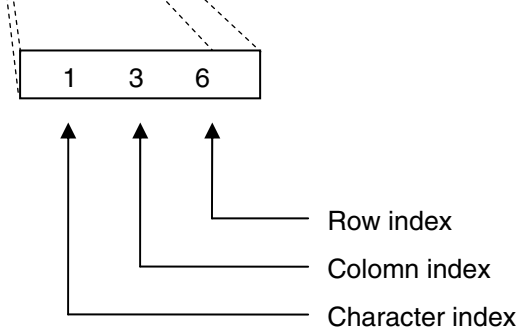


Table 10: LCD segment assignment

3.12 External LCD resistors, RR1 – RR5

The *78K0/Lx3 - See it!* board can also be configured to use external voltage divider resistors for the generation of the LCD drive power supplies. For more details on the external resistance division method please refer to the user's manual of the 78K0/LF3 device.

3.13 Temperature sensor, U2

For temperature measurement and primarily as an application example the *78K0/Lx3 - See it!* board is equipped within an temperature sensor IC (type S-8120C). The output pin of the temperature sensor is connected to pin P21/ANI1/DS0+ of the 78K0/LF3 device.

3.14 IR receiver module, U4

For remote control application an IR receiver module is equipped on the *78K0/Lx3 - See it!* board. The output terminal of the IR receiver (type RPM7138) is connected to the remote control input pin P41/KR1/RIN of the 78K0/LF3 device.

3.15 Buzzer, BUZ1

To generate acoustic signals and sound waves a buzzer is connected to the timer output port of the 16-Bit Timer/Event Counter 00, equal to port P34/TI52/TI010/TO00/RTC1HZ/INTP1 of the 78K0/LF3 device. The AC buzzer operates in a voltage range of 2V…5V.

3.16 Power LED, LED1

LED1 is the power LED of the *78K0/Lx3 – See it!* board. It indicates if power is applied to the *78K0/Lx3 – See it!* board.

3.17 Connectors T1 – T13 and wrap field

Several pins of the 78K0/LF3 microcontroller are combined to the connectors T1 – T13. The corresponding assignment can be found in table below. Additional the *78K0/Lx3 - See it!* board provides a wire wrap field area allowing the integration of additional application hardware.

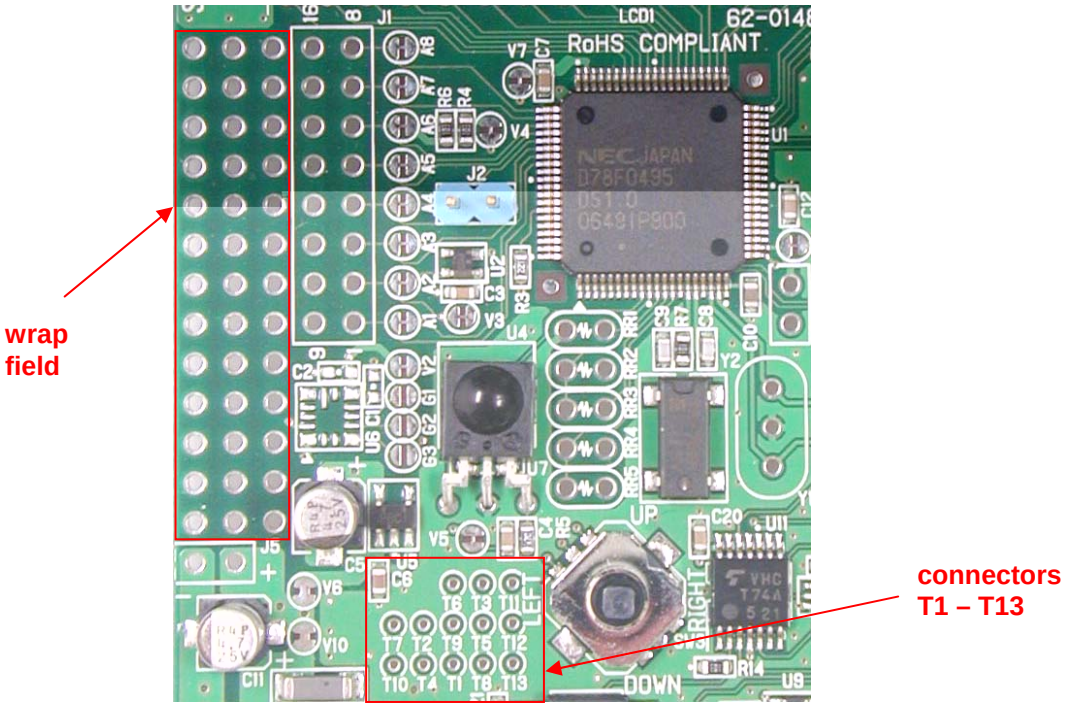


Figure 5: Connectors T1 – T13 and wrap field

Connector	78K0/LF3 I/O pin
T1	P14 / SCKA0 / INTP4
T2	P32 / TOH0 / MCG0
T3	P13 / SO10 / TxD0
T4	P33 / TIO00 / RTCDIV / RTCCL / BUZ / INTP2
T5	P12 / SI10 / RxD0
T6	P16 / SOA0 / TxD6
T7	P30 / INTP5
T8	P11 / SCK10
T9	P15 / SIA0 / RxD6
T10	P31 / TOH1 / INTP3
T11	P10 / PCL
T12	P120 / INTP0 / EXLVI
T13	P47 / KR7

Table 11: Connectors T1 – T13

3.18 Soldering bridges

Additional configuration of the *78K0/Lx3 - See it!* board can be done by the soldering bridges A1 – A8 and V1 – V11. The different configuration modes are shown in the tables below.

The soldering bridges A1 – A8 and V7 can be used to reconfigure the A/D converter input channels and the reference input voltage.

Soldering bridge	Configuration	78K0/LF3 pin	
A1	Closed (default)	ANI0/DS0-	connected to V_{SS}
	Open		disconnected from V_{SS}
A2	Closed (default)	ANI1/DS0+	connected to temperature sensor U2
	Open		disconnected from to temperature sensor U2
A3	Closed (default)	ANI2/DS1-	connected to V_{SS}
	Open		disconnected from V_{SS}
A4	Closed (default)	ANI3/DS1+	pin connected to jumper J2
	Open		disconnected from jumper J2
A5	Closed (default)	ANI4/DS2-	connected to V_{SS}
	Open		disconnected from V_{SS}
A6	Closed (default)	ANI5/DS2+	connected to V_{DD27}
	Open		disconnected from V_{DD27}
A7	Closed (default)	ANI6/REF-	connected to V_{SS}
	Open		disconnected from V_{SS}
A8	Closed (default)	ANI7/REF+	connected to V_{DD}
	Open		disconnected from V_{DD}
V7	Closed (default)	AVREF	connected to V_{DD}
	Open		disconnected from V_{DD}

Table 12: Setting of soldering bridges A1 – A8, V7

The soldering bridges V1 – V6 and V8 - V11 can be used to reconfigure the power supply of dedicated circuits of the *78K0/Lx3 - See it!* board. For more details please refer also to the schematics of the *78K0/Lx3 - See it!* board.

Soldering bridge	Configuration	Circuit	
V1	Closed (default)	BUZ1	connected to V_{DD}
	Open		disconnected from V_{DD}
V2	Closed (default)	U6 (not assembled)	connected to V_{DD}
	Open		disconnected from V_{DD}
V3	Closed (default)	U2	connected to V_{DD27}
	Open		disconnected from V_{DD27}
V6	Closed (default)	U5	connected to V_{DD}
	Open		disconnected from V_{DD}
V8	Closed (default)	U1	connected to V_{DD}
	Open		disconnected from V_{DD}
V9	Closed (default)	LED1	connected to V_{DD}
	Open		disconnected from V_{DD}
V10	Closed (default)	V_{DD} connected to $_{USB}V_{DD}$	
	Open	V_{DD} disconnected from $_{USB}V_{DD}$	
V11	Closed (default)	V_{DD2} connected to V_{DD}	
	Open	V_{DD2} disconnected from V_{DD}	

Table 13: Setting of soldering bridges V1 – V6, V8 – V11

3.19 78K0/LF3 memory map

The memory layout of 78K0/LF3 device shown in the figure below.

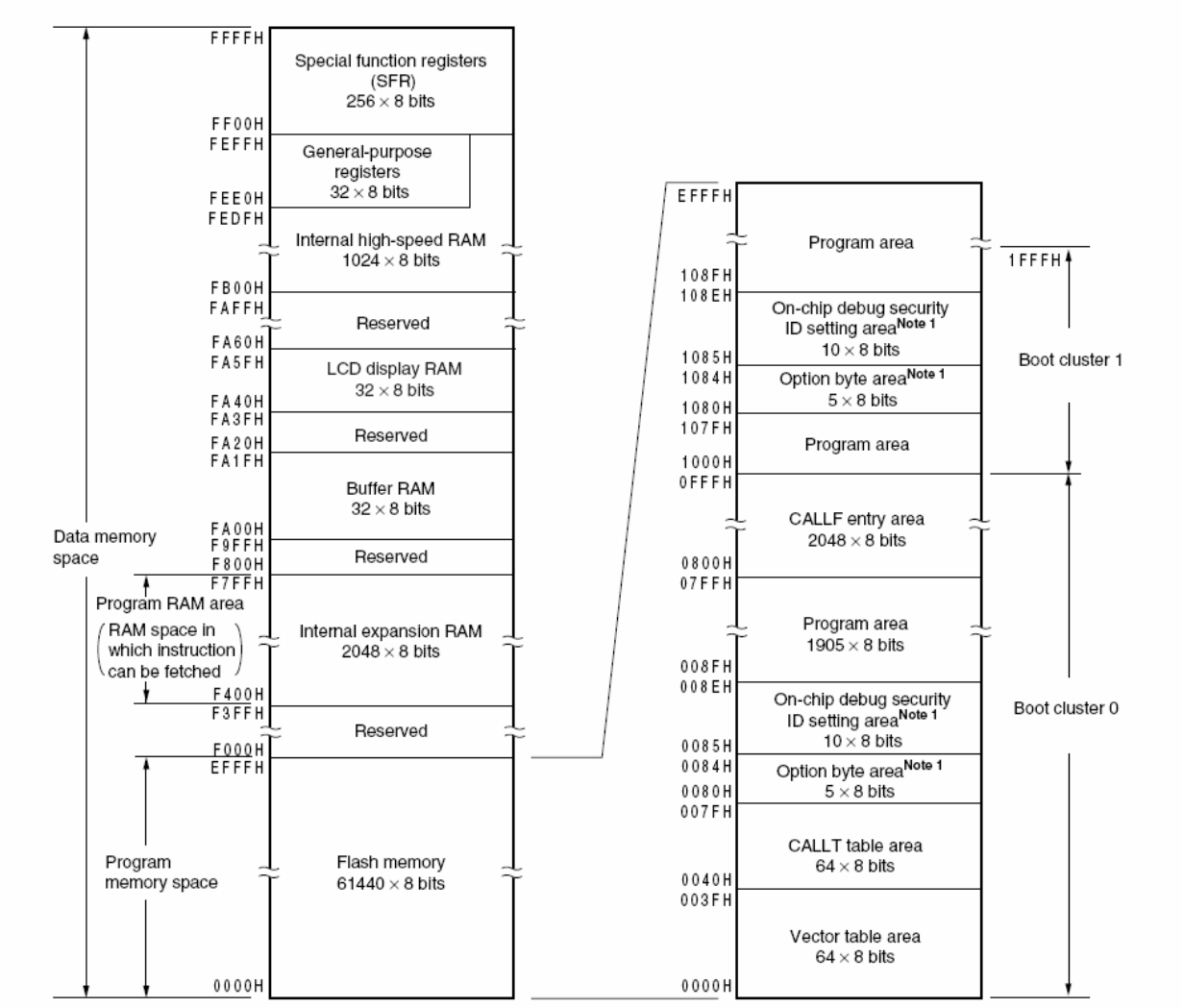


Figure 6: 78K0/LF3 memory map

The *78K0/Lx3 - See it!* does not reserve any resources of the 78K0/LF3 device, consequently all available memory of the device is free for application software.

4. On-Chip debugging

The *78K0/Lx3 - See it!* board offers two possibilities to use On-Chip debugging. The TK-78 debug function of *78K0/Lx3 - See it!* allows On-Chip debugging without a need of external debug hardware. Within this mode the default USB / UART connection to the Host computer is used as debug interface. All standard debug functions are available in the On-Board debugging mode like FLASH programming / downloading, code execution, single stepping, breakpoints, memory manipulation etc.

Additionally *78K0/Lx3 - See it!* supports the QB-MINI2 On-Chip debug emulator in order to use On-Chip debug function of the 78K0/LF3 device. The system configuration for On-Chip debugging is shown in figure below.

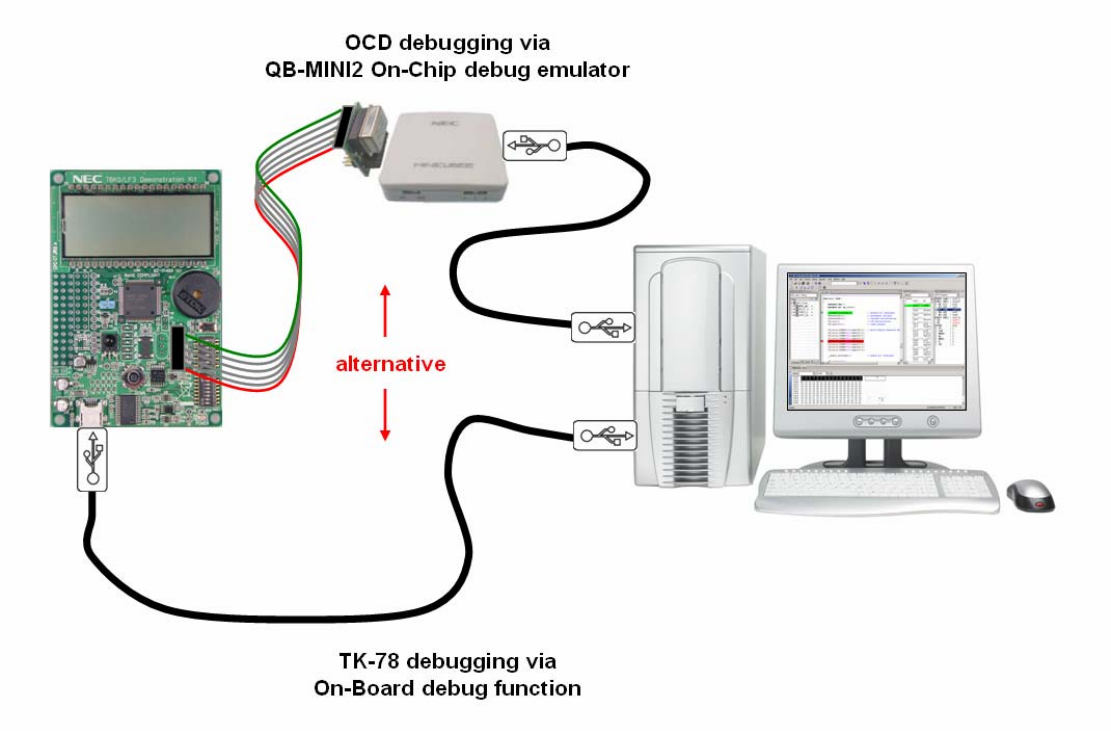


Figure 7: On-Chip Debugging

4.1 OCD via TK-78 debug function

To operate the *78K0/Lx3 - See it!* board within the On-Board debug mode, configure switches SW1 and SW2 as following:

Mode	SW2								SW1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
On-Board Debug	ON	ON			don't care				ON	ON	ON	ON	ON	ON		
			OFF	OFF											OFF	OFF

Table 14: Configuration for TK-78 debugging

4.2 OCD via QB-MINI2 emulator

To operate the *78K0/Lx3 - See it!* board together with the QB-MINI2 On-Chip debug emulator, configure switches SW1 and SW2 as following:

Mode	SW2								SW1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
QB-MINI2	ON	ON			don't care											
			OFF	OFF					OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Table 15: Configuration for QB-MINI2 debugging

Note: By supplying power from the QB-MINI2 do not connect external hardware to the *78K0/Lx3 - See it!* board. Within this mode the *78K0/Lx3 - See it!* board can operate without external power supply from USB.

5. *78K0/Lx3 - See it!* installation and operation

5.1 Getting started

The IAR C-SPY debugger allows to download and debug application software on the *78K0/Lx3 - See it!* starterkit hardware. Additionally the WriteEZ3 FLASH programming software can be used for simple FLASH programming of the 78K0/LF3 internal FLASH memory. As communication interface between the host computer and the *78K0/Lx3 - See it!* board a USB interface line is needed. Before you can download, debug or execute an application program, hardware and software must be installed properly.

5.1.1 CD-ROM contents

The CD-ROM shows following directory structure:

78K0/Lx3 - See it! (F:)	CD-ROM ROOT
Acrobat	- Acrobat Reader for 32Bit Windows OS
Doc	- Documentation
WriteEZ3	- WriteEZ3 FLASH programming software
Drivers	… USB driver
WriteEZ3	… WriteEZ3 setup directory
PRM	… PRM parameter files
IAR Embedded Workbench 78K	- IAR Embedded Workbench for 78K
SamplePrograms	- Sample programs for *78K0/Lx3 - See it!*

Table 16: *78K0/Lx3 - See it!* CD-ROM directory structure

6. Hardware installation

After unpacking *78K0/Lx3 - See it!,* connect the board to your host computer using the provided USB interface cable. When *78K0/Lx3 - See it!* is connected, the USB driver needs to be installed on the host machine. Please refer to the following **CHAPTER 7 SOFTWARE INSTALLATION**.

7. Software installation

The *78K0/Lx3 - See it!* package comes with several software demo packages:

- IAR Systems Embedded Workbench for 78K, including C compiler, assembler, linker, librarian and IAR C-SPY debugger / simulator
- WriteEZ3 FLASH programming software
- Sample program

The IAR Systems Embedded Workbench and the WriteEZ3 FLASH programming GUI must be installed on your PC. For detailed installation hints, refer to the following chapters and to the corresponding documentation of the IAR Embedded Workbench.

7.1 IAR Systems Embedded Workbench for 78K installation

To install the IAR Systems Embedded Workbench for 78K including C-SPY debugger / simulator, select the `SETUP` program in the directory `\IAR Embedded Workbench 78K\ew78k\` of the CDROM. The setup dialogues will guide you through the installation process.

7.2 WriteEZ3 FLASH programming GUI installation

To install the WriteEZ3 FLASH programming GUI select the `SETUP` program in the directory `\WriteEZ3\` of the CDROM. The setup dialogues will guide you through the installation process.

7.3 Sample program installation

To install the sample/demonstration program for the *78K0/Lx3 - See it!* board select the `SETUP` program in the directory `\SamplePrograms\` of the CDROM. The setup dialogues will guide you through the installation process.

7.4 USB Driver Installation

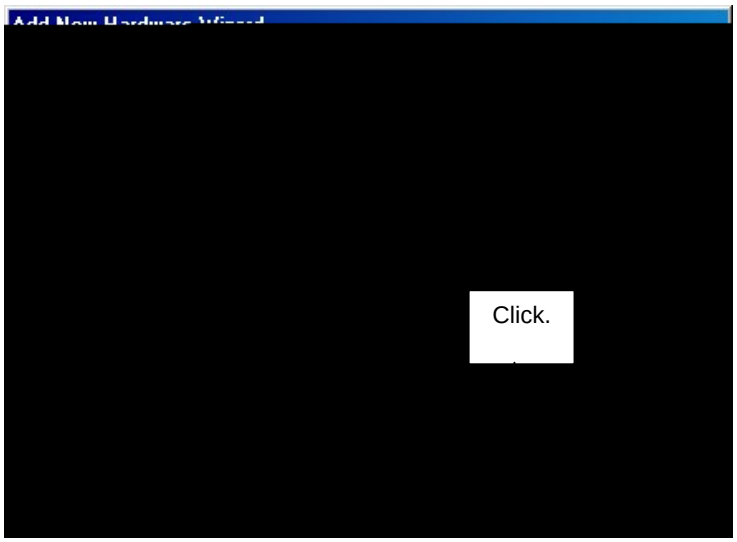
In order to use the *78K0/Lx3 - See it!* board for On-Chip debugging or FLASH programming, the USB driver needs to be installed on the host machine. Install the driver according to the following procedure:

Installation on Windows 98SE/Me ..... Page 30
Installation on Windows 2000 ..... Page 32
Installation on Windows XP ..... Page 38

7.4.1 Installation on Windows 98SE/Me

1. When the *78K0/Lx3 - See it!* board is connected with the host machine, the board is recognized by Plug and Play, and the wizard for adding new hardware is started. Click Next>.

Figure 8: Add New Hardware Wizard (Windows 98SE)

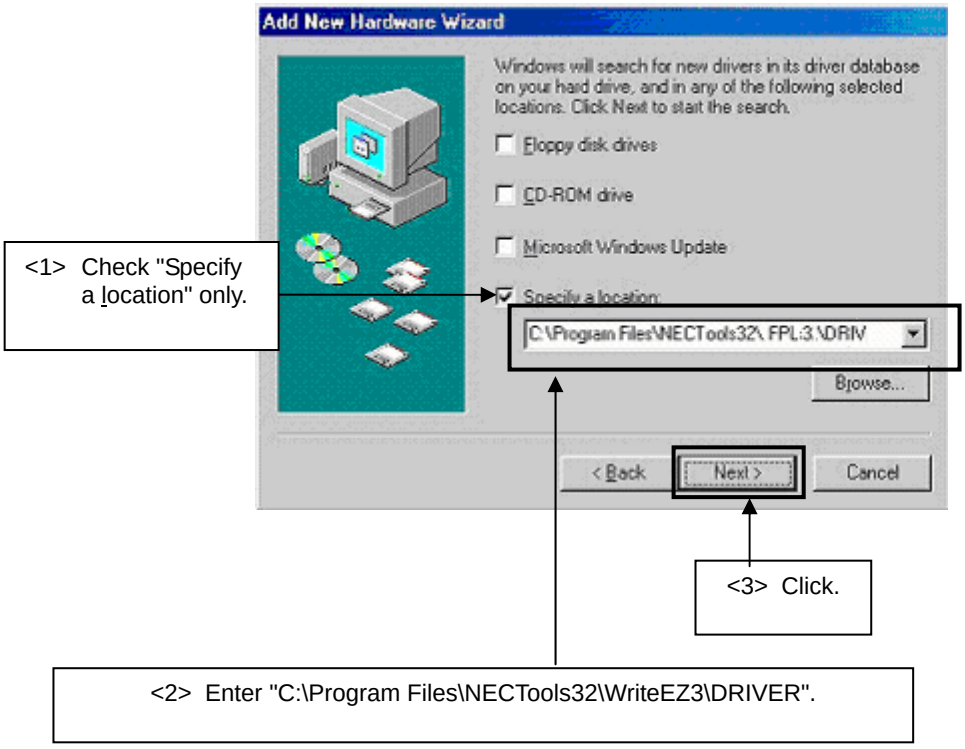


2. The window below is displayed. So, check that "Search for a suitable driver ..." is selected, then click Next>.

Figure 9: Search Method (Windows 98SE)

3. Check the "Specify a location" check box only and enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER" in the address bar, then click Next>.

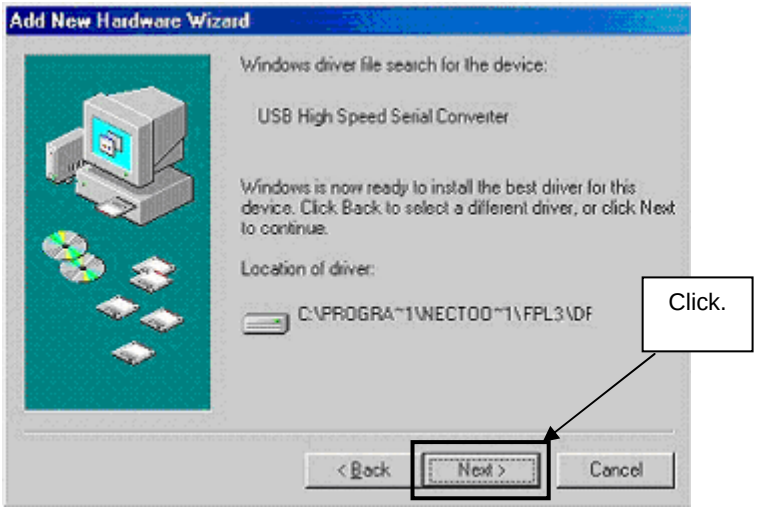
Figure 10: Search Location Specification (Windows 98SE)


Add New Hardware Wizard
Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected locations. Click Next to start the search.
Floppy disk drives
CD-ROM drive
Microsoft Windows Update
Specify a location:
C:\Program Files\NECTools32\ FPL3 \DRIV
Browse...
< Back
Next >
Cancel
<1> Check "Specify a location" only.
<2> Enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER".
<3> Click.

Remark If the installation destination folder is changed at the time of GUI software installation, enter "new-folder\DRIVER".

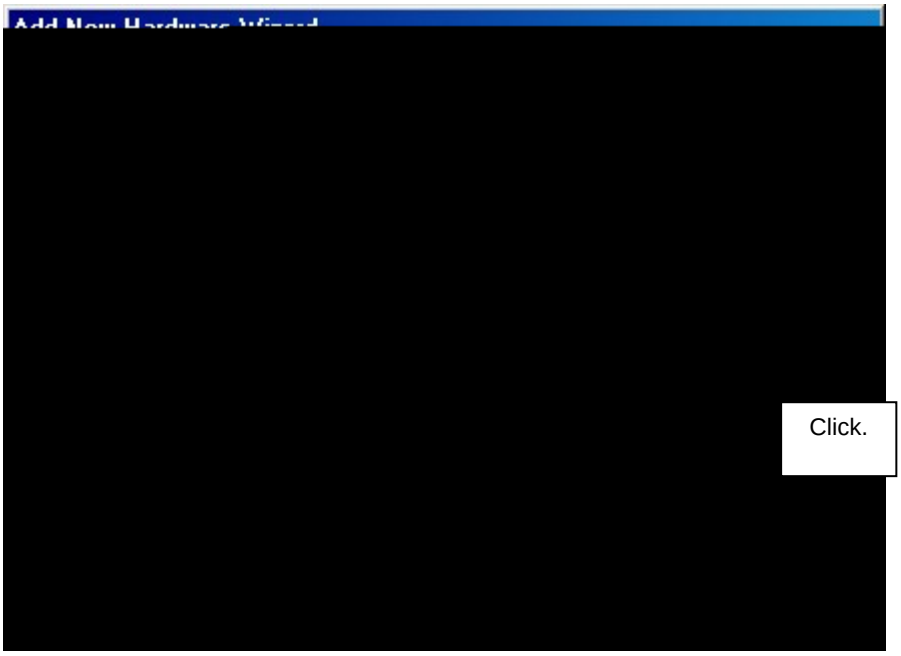
4. The window below is displayed. Click Next>.

Figure 11: Checking Driver to Be Installed (Windows 98SE)


Add New Hardware Wizard
Windows driver file search for the device:
USB High Speed Serial Converter
Windows is now ready to install the best driver for this device. Click Back to select a different driver, or click Next to continue.
Location of driver:
C:\PROGRA~1\NECTOO~1\FPL3\DF
< Back
Next >
Cancel
Click.

5. When the window below is displayed, the installation of the USB driver is completed. Click Finish. The installation of the USB Serial Port driver is then automatically performed.

Figure 12: Installation Completion (Windows 98SE)



7.4.2 Installation on Windows 2000

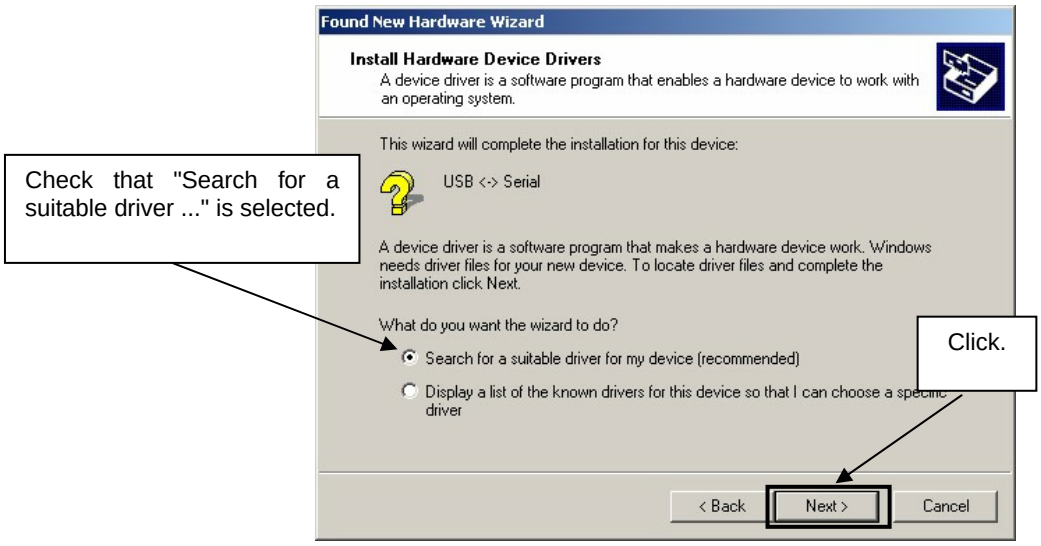
1. When the *78K0/Lx3 - See it!* board is connected with the host machine, the board is recognized by Plug and Play, and the wizard for finding new hardware is started. Click Next>.

Figure 13: Found New Hardware Wizard 1 (Windows 2000)

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
Click.
To continue, click Next.
< Back
Next >
Cancel

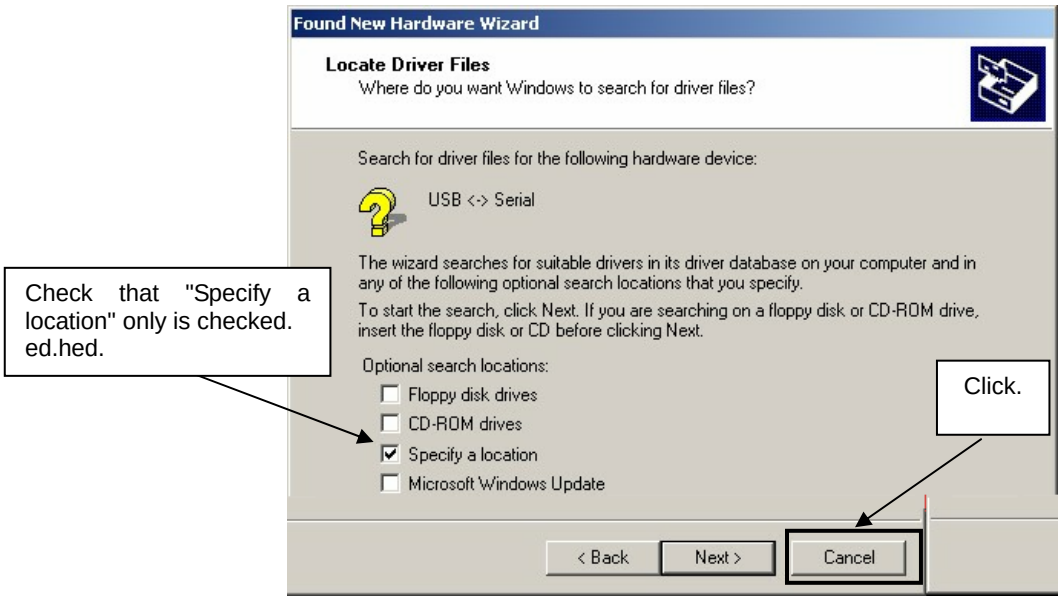
2. The window below is displayed. So, check that "Search for a suitable driver ..." is selected, then click Next>.

Figure 14: Search Method 1 (Windows 2000)


Found New Hardware Wizard
Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.
This wizard will complete the installation for this device:
USB <-> Serial
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
What do you want the wizard to do?
Search for a suitable driver for my device (recommended)
Display a list of the known drivers for this device so that I can choose a specific driver
< Back
Next >
Cancel
Check that "Search for a suitable driver ..." is selected.
Click.

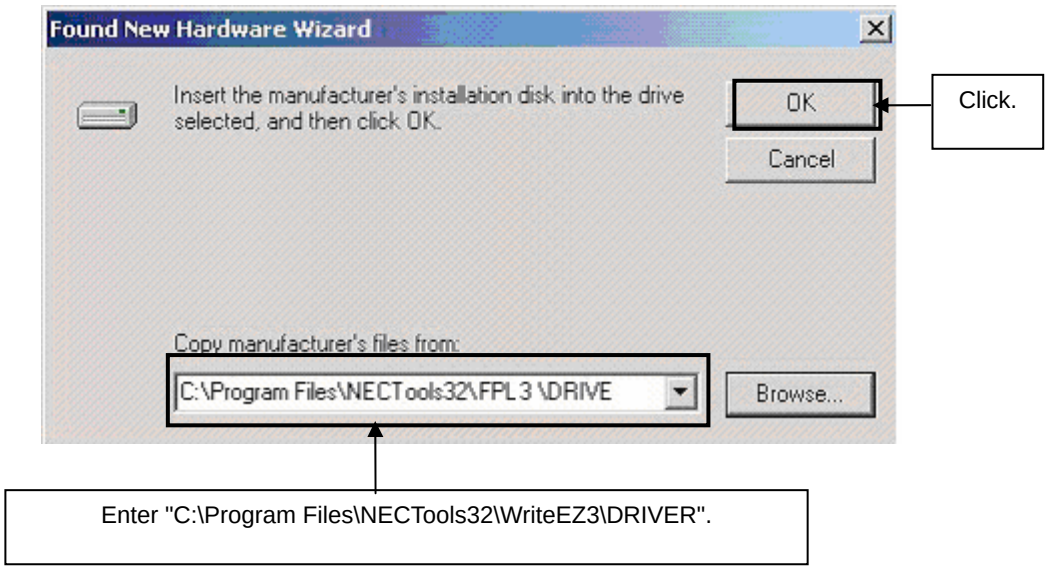
3. Check the "Specify a location" check box only, then click Next>.

Figure 15: Driver File Location 1 (Windows 2000)


Found New Hardware Wizard
Locate Driver Files
Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
USB <-> Serial
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back
Next >
Cancel
Check that "Specify a location" only is checked. ed.hed.
Click.

4. Enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER" in the address bar, then click OK.

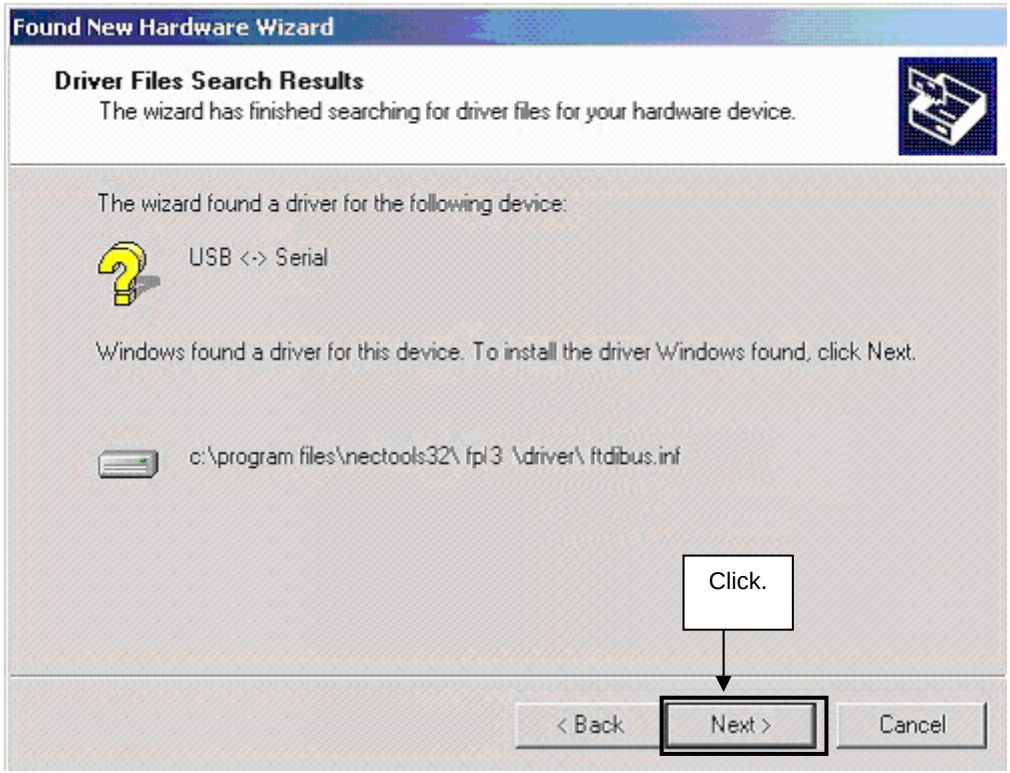
Figure 16: Address Specification 1 (Windows 2000)



Remark If the installation destination folder is changed at the time of GUI software installation, enter "new-folder\WriteEZ3\DRIVER".

5. Click Next>.

Figure 17: Driver File Search 1 (Windows 2000)


Found New Hardware Wizard
Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.
The wizard found a driver for the following device:
USB <-> Serial
Windows found a driver for this device. To install the driver Windows found, click Next.
c:\program files\nectools32\ fpl3 \driver\ ftdibus.inf
Click.
< Back
Next >
Cancel

6. Click Finish to complete the installation of the USB driver.

Figure 18: USB Driver Installation Completion 1 (Windows 2000)

Found New Hardware Wizard
Completing the Found New Hardware Wizard
USB High Speed Serial Converter
Windows has finished installing the software for this device.
Click.

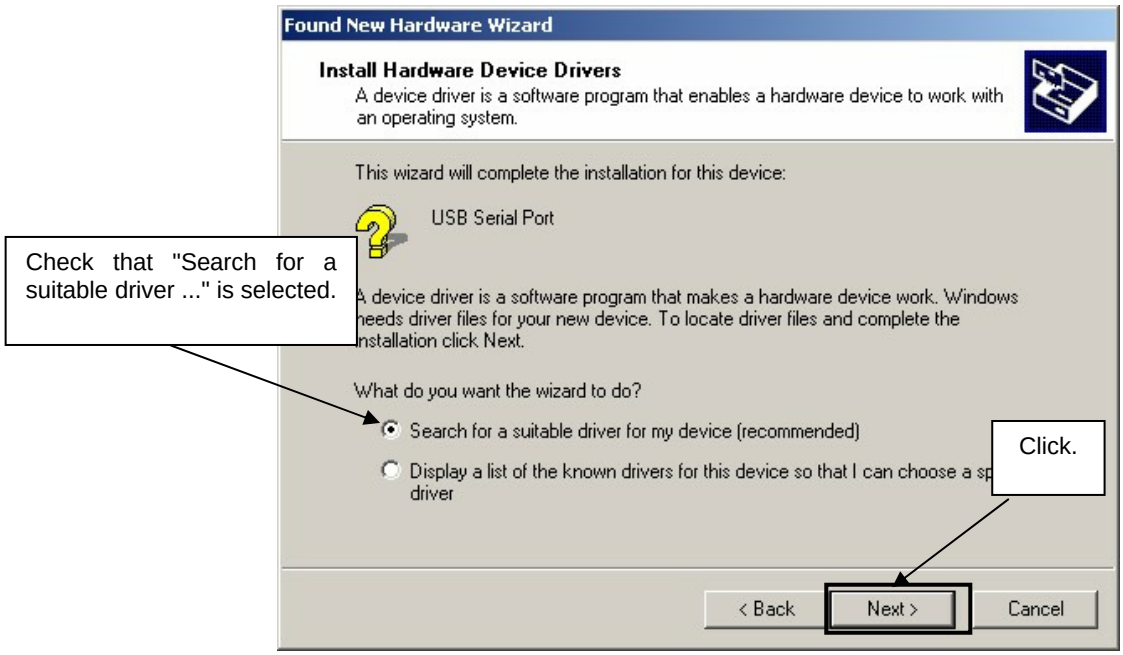
7. Proceed to the installation of the USB Serial Port driver. Click Next>.

Figure 19: Found New Hardware Wizard 2 (Windows 2000)

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
To continue, click Next.
Click.
< Back
Next >
Cancel

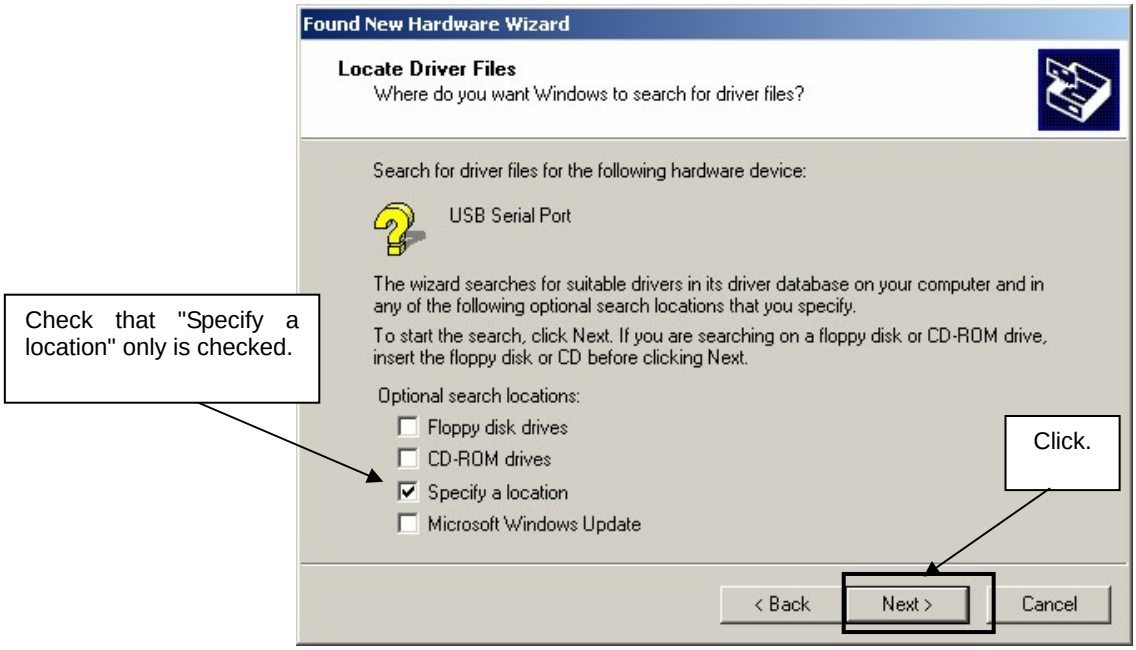
8. The window below is displayed. So, check that "Search for a suitable driver ..." is selected, then click Next>.

Figure 20: Search Method 2 (Windows 2000)


Found New Hardware Wizard
Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.
This wizard will complete the installation for this device:
USB Serial Port
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
What do you want the wizard to do?
Search for a suitable driver for my device (recommended)
Display a list of the known drivers for this device so that I can choose a sp driver
< Back
Next >
Cancel
Check that "Search for a suitable driver ..." is selected.
Click.

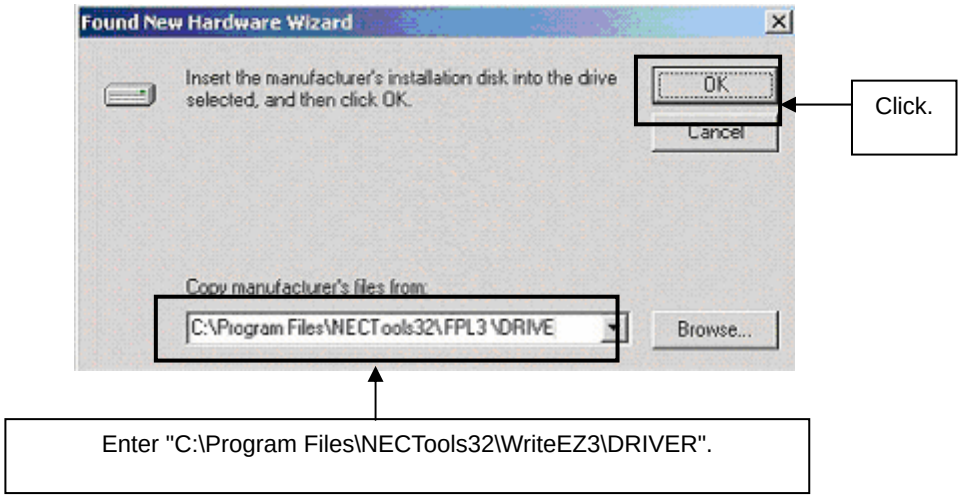
9. Check the "Specify a location" check box only, then click Next>.

Figure 21: Driver File Location 2 (Windows 2000)


Found New Hardware Wizard
Locate Driver Files
Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
USB Serial Port
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back
Next >
Cancel
Check that "Specify a location" only is checked.
Click.

10. Enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER" in the address bar, then click OK.

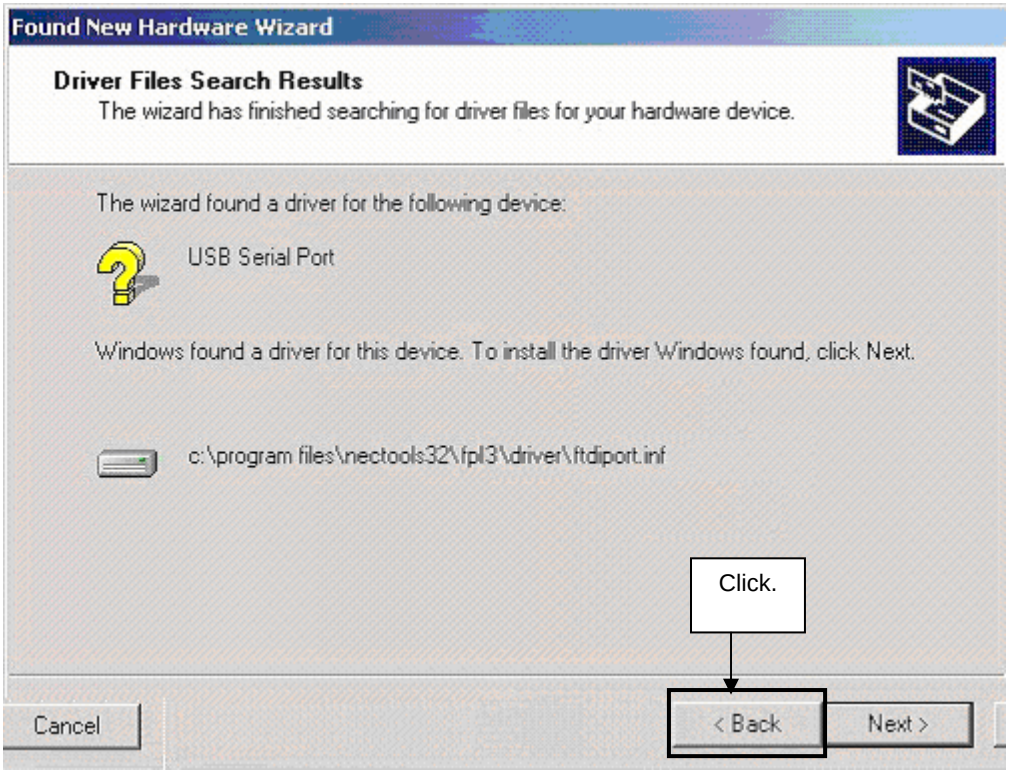
Figure 22: Address Specification 2 (Windows 2000)



Remark If the installation destination folder is changed at the time of GUI software installation, enter "new-folder\DRIVER".

11. Click Next>.

Figure 23: Driver File Search 2 (Windows 2000)


Found New Hardware Wizard
Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.
The wizard found a driver for the following device:
USB Serial Port
Windows found a driver for this device. To install the driver Windows found, click Next.
c:\program files\nectools32\fpl3\driver\ftdiport.inf
Click.
Cancel
< Back
Next >

12. Click Finish to complete the installation of the USB driver.

Figure 24: USB Driver Installation Completion 2 (Windows 2000)

7.4.3 Installation on Windows XP

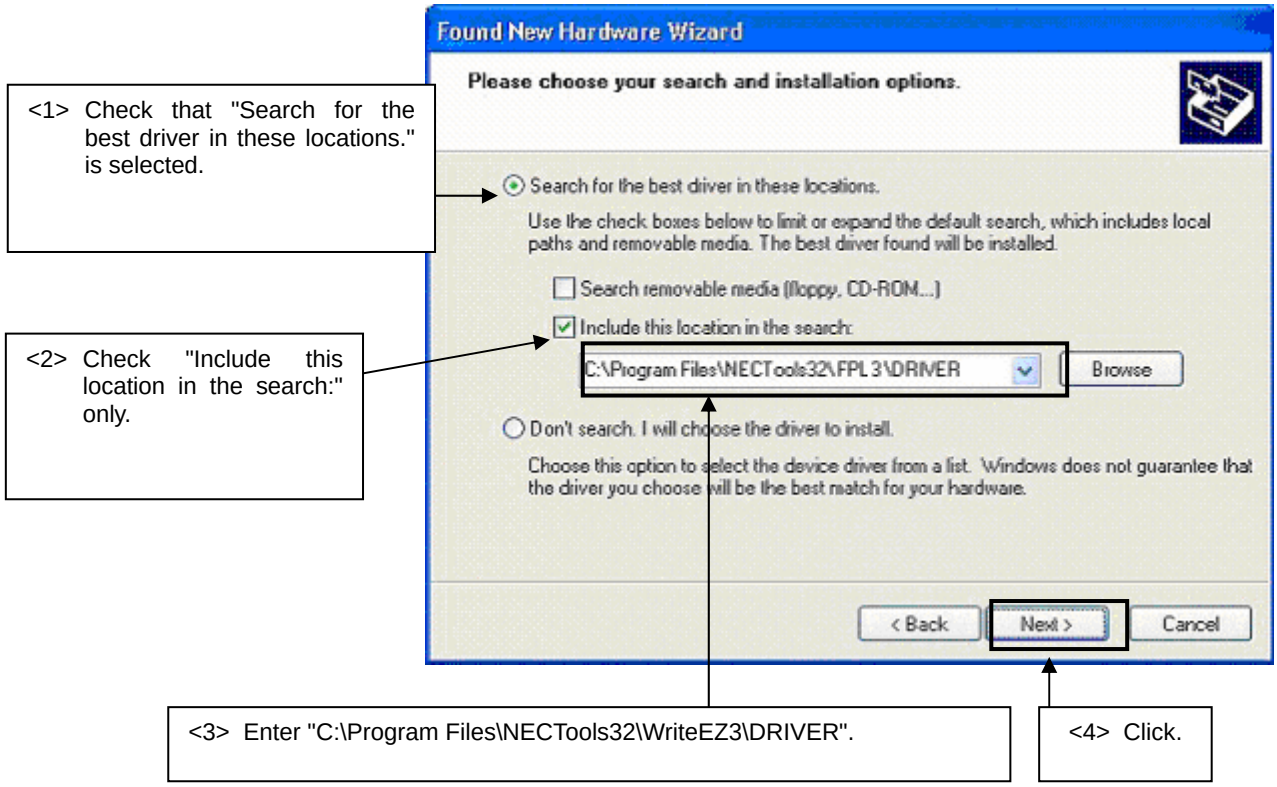
1. When the *78K0/Lx3 - See it!* board is connected with the host machine, the board is recognized by Plug and Play, and the wizard for finding new hardware is started. Check that "Install from a list or specific ..." is selected, then click Next>.

Figure 25: Found New Hardware Wizard 1 (Windows XP)

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
USB <-> Serial
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Check that "Install from a list or specific ..." is selected.
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click.
Click Next to continue.
< Back
Next >
Cancel

2. Check that "Search for the best driver in these locations." is selected. Check the "Include this location in the search:" check box and enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER" in the address bar, then click Next>.

Figure 26: Search Location Specification 3 (Windows XP)


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
C:\Program Files\NECTools32\FPL3\DRIVER
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel
<1> Check that "Search for the best driver in these locations." is selected.
<2> Check "Include this location in the search:" only.
<3> Enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER".
<4> Click.

3. As shown below, "has not passed Windows Logo testing to verify its compatibility with Windows XP." is displayed. Click Continue Anyway.

Figure 27: Windows XP Logo Testing 3 (Windows XP)

Hardware Installation
The software you are installing for this hardware:
USB High Speed Serial Converter
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation
Click.

4. When the window below is displayed, the installation of the USB driver is completed. Click Finish.

Figure 28: USB Driver Installation Completion 1 (Windows XP)

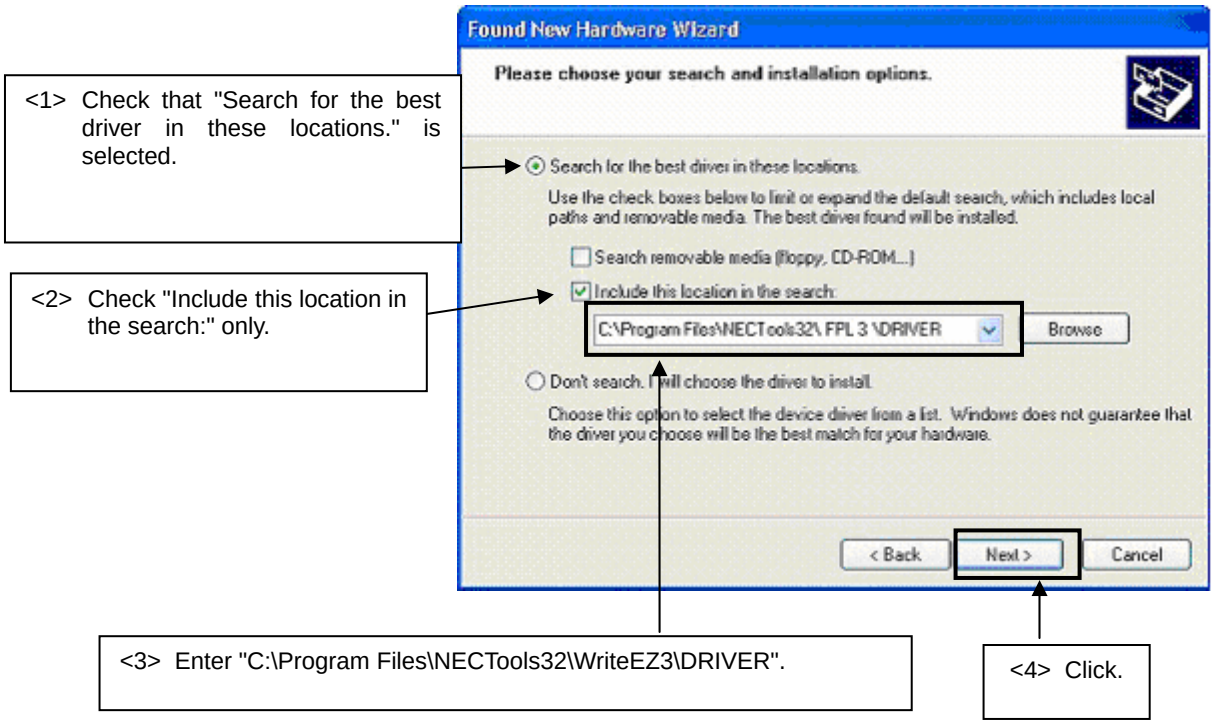
5. Proceed to the installation of the USB Serial Port driver. Click Next>.

Figure 29: Found New Hardware Wizard 2 (Windows XP)

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
USB Serial Port
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel
Check that "Install from a list or specific ..." is selected.
Click.

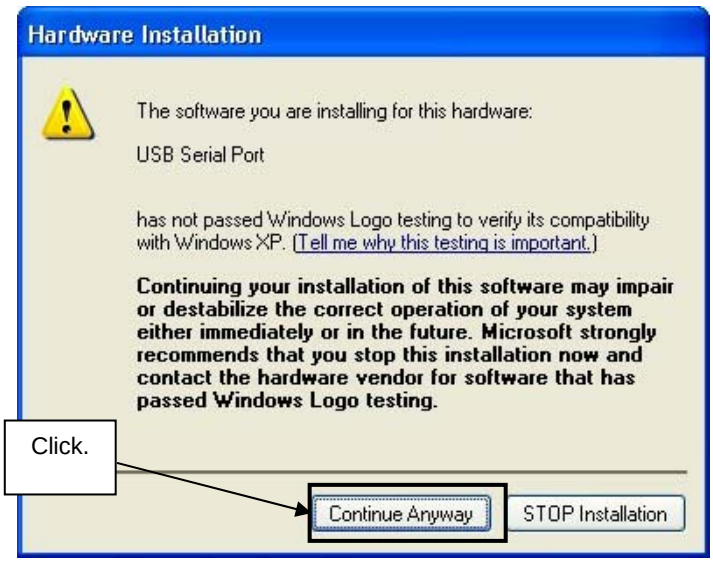
6. Check that "Search for the best driver in these locations." is selected. Check the "Include this location in the search:" check box and enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER", then click Next>.

Figure 30: Search Location Specification 2 (Windows XP)


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
C:\Program Files\NECTools32\ FPL 3 \DRIVER
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel
<1> Check that "Search for the best driver in these locations." is selected.
<2> Check "Include this location in the search:" only.
<3> Enter "C:\Program Files\NECTools32\WriteEZ3\DRIVER".
<4> Click.

7. As shown below, "has not passed Windows Logo testing to verify its compatibility with Windows XP." is displayed. Click Continue Anyway.

Figure 31: Windows XP Logo Testing 2 (Windows XP)


Hardware Installation
The software you are installing for this hardware:
USB Serial Port
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation
Click.

8. When the window below is displayed, the installation of the USB driver is completed. Click Finish.

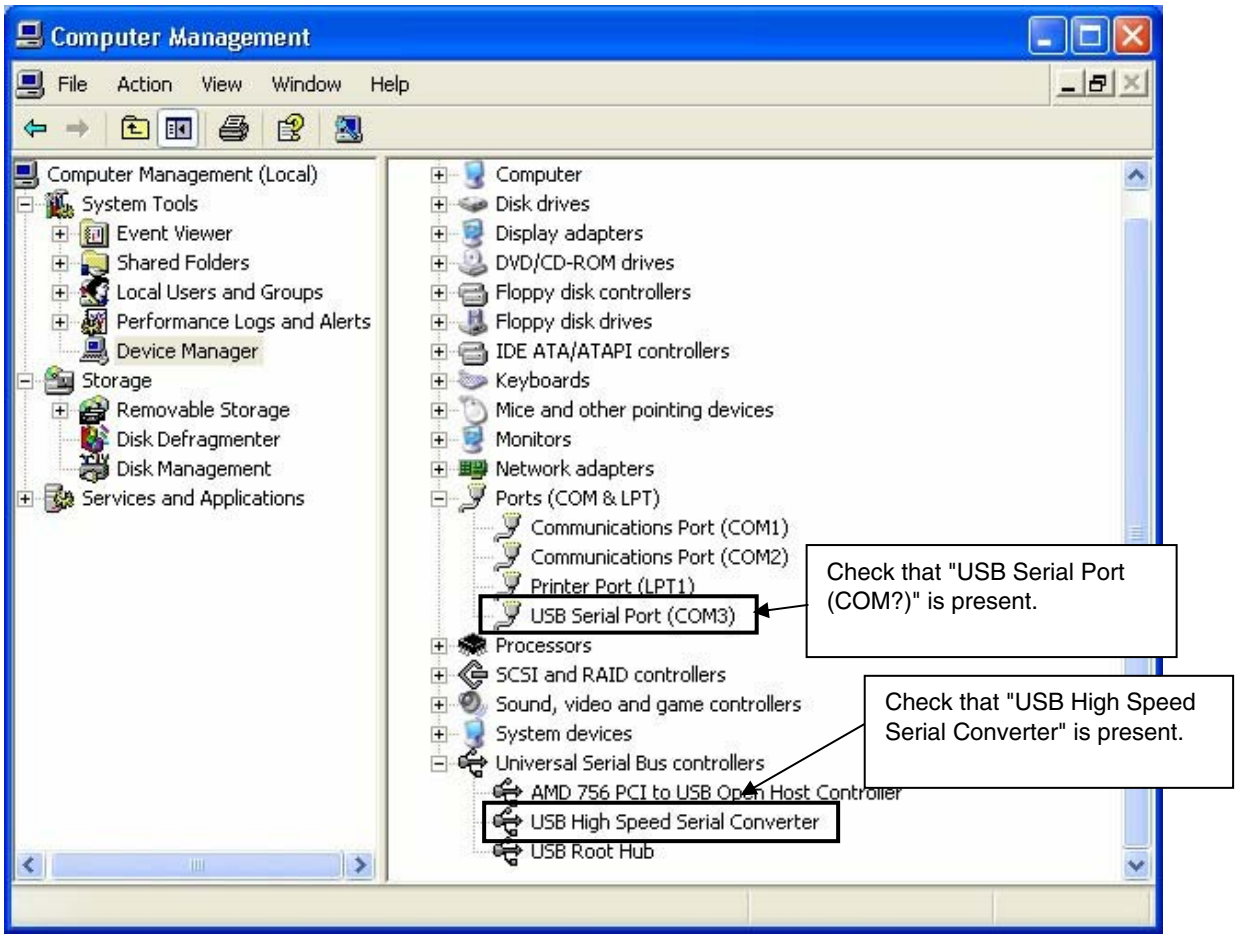
Figure 32: USB Serial Port2 Driver Installation Completion (Windows XP)

7.5 Confirmation of USB Driver Installation

After installing the two types of drivers, check that the drivers have been installed normally, according to the procedure below. When using the *78K0/Lx3 - See it!* board in combination with the IAR C-SPY debugger and the WriteEZ3 FLASH programming GUI, the information to be checked here is needed.

By clicking the "Device Manager" tab, check that the drivers are installed normally.

Figure 33: Device Manager



For Windows 98SE/Me

Caution	Do not select Update and Erase when communicating with the target device.

For Windows 2000/XP

Caution	Do not perform "Hardware Modification Scan" when communicating with the target device.

Remark In the GUI port list box, the same communication port as COM? of USB Serial Port (COM?) needs to be selected.

If the drivers above are not displayed, or the mark "×" or "!" is prefixed, refer to **CHAPTER 10 TROUBLESHOOTING**.

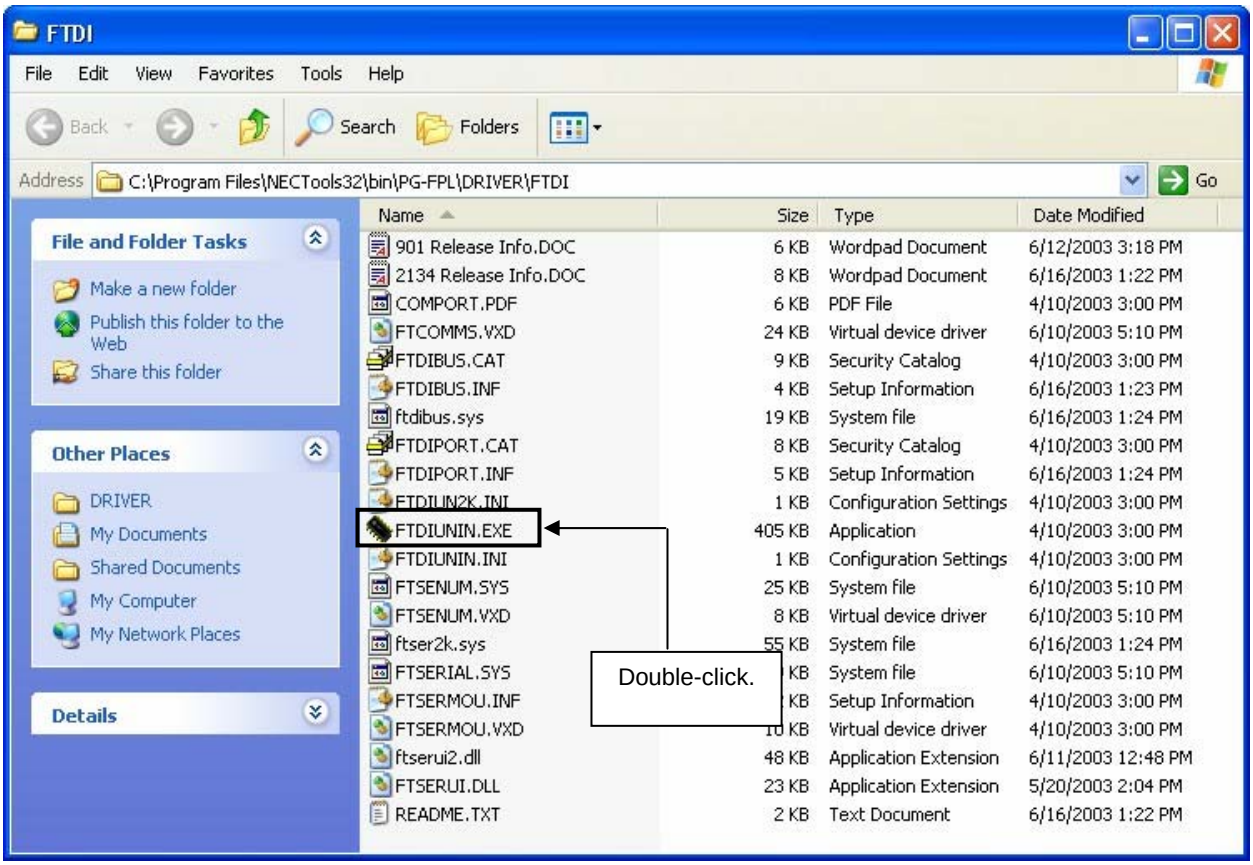
7.6 Driver deinstallation

The driver deinstallation program is installed on the host machine when the WriteEZ3 software is installed. Use the procedure below for deinstall the USB driver.

1. When using Windows XP, log on as the computer administrator. When using Windows 2000, log on as the Administrator.

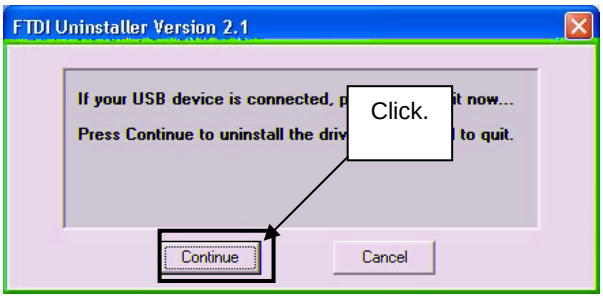
2. Double-click in the order from "My Computer" to "(C:)" to "Program Files" to "NECTools32" to "WriteEZ3" to "DRIVER". "Ftdiunin.exe" is displayed. Double-click "Ftdiunin.exe".

Figure 34: Driver Uninstallation


FTDI
File Edit View Favorites Tools Help
Back Search Folders
Address C:\Program Files\NECTools32\bin\PG-FPL\DRIVER\FTDI
Go
File and Folder Tasks
Make a new folder
Publish this folder to the Web
Share this folder
Other Places
DRIVER
My Documents
Shared Documents
My Computer
My Network Places
Details
Name Size Type Date Modified
901 Release Info.DOC 6 KB Wordpad Document 6/12/2003 3:18 PM
2134 Release Info.DOC 8 KB Wordpad Document 6/16/2003 1:22 PM
COMPORT.PDF 6 KB PDF File 4/10/2003 3:00 PM
FTCOMMS.VXD 24 KB Virtual device driver 6/10/2003 5:10 PM
FTDIBUS.CAT 9 KB Security Catalog 4/10/2003 3:00 PM
FTDIBUS.INF 4 KB Setup Information 6/16/2003 1:23 PM
ftdibus.sys 19 KB System file 6/16/2003 1:24 PM
FTDIPORT.CAT 8 KB Security Catalog 4/10/2003 3:00 PM
FTDIPORT.INF 5 KB Setup Information 6/16/2003 1:24 PM
FTDIUN2K.INI 1 KB Configuration Settings 4/10/2003 3:00 PM
FTDIUNIN.EXE 405 KB Application 4/10/2003 3:00 PM
FTDIUNIN.INI 1 KB Configuration Settings 4/10/2003 3:00 PM
FTSENUM.SYS 25 KB System file 6/10/2003 5:10 PM
FTSENUM.VXD 8 KB Virtual device driver 6/10/2003 5:10 PM
ftser2k.sys 55 KB System file 6/16/2003 1:24 PM
FTSERIAL.SYS KB System file 6/10/2003 5:10 PM
FTSERMOU.INF KB Setup Information 4/10/2003 3:00 PM
FTSERMOU.VXD 10 KB Virtual device driver 4/10/2003 3:00 PM
ftserui2.dll 48 KB Application Extension 6/11/2003 12:48 PM
FTSERUI.DLL 23 KB Application Extension 5/20/2003 2:04 PM
README.TXT 2 KB Text Document 6/16/2003 1:22 PM
Double-click.

3. Click Continue.

Figure 35: Driver Uninstaller


FTDI Uninstaller Version 2.1
If your USB device is connected, p it now...
Press Continue to uninstall the driv to quit.
Click.
Continue
Cancel

4. Click Finish to complete driver uninstallation.

Figure 36: Completion of Driver Uninstallation

Caution	If the GUI software is uninstalled earlier, "Ftdiunin.exe" is also deleted. At this time, delete "USB Serial Port (COM?)" and "USB High Speed Serial Converter" from Device Manager manually.

8. WriteEZ3 FLASH programming software

8.1 Introduction

The parameter file for the 78K0/LF3 device is installed automatically during installation of WriteEZ3 GUI, folder < WriteEZ3 install-path>\PRM. Nevertheless, newest version of parameter file for the μPD78F0495 device can by download from the NEC Electronics Web site.

Download the parameter file for the PG-FP4 from the following NEC Electronics Web site:

http://www.eu.necel.com/updates

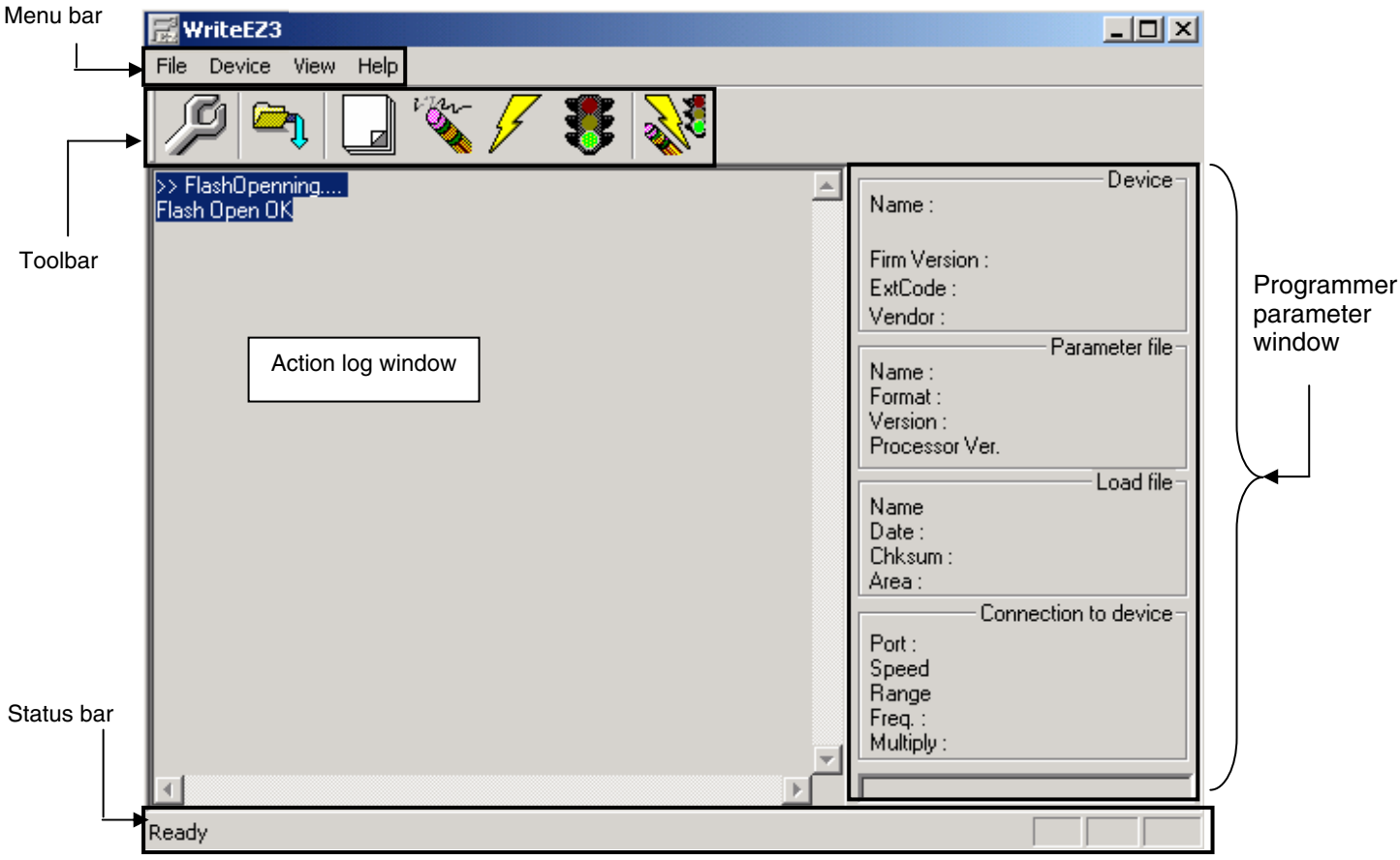
Copy the parameter file downloaded from the NEC Electronics Web site into sub-directory <WriteEZ3.EXE-install-path>\PRM created during GUI software setup (refer to **CHAPTER 7 SOFTWARE INSTALLATION**)..

8.2 Starting up the GUI Software

- GUI software startup
  Select WriteEZ3.EXE from the start menu to start the WriteEZ3 GUI software.

When the GUI software is started normally, the following screen appears.

Figure 37: GUI Software Main Window



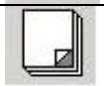
This window consists of the following items:

Name	Display Information
Menu bar (displayed at the top)	Displays menu items executable by the WriteEZ3.
Toolbar (displayed under the menu bar)	Displays frequently used commands as icons.
Action log window (displayed under the toolbar)	Displays an WriteEZ3 action log.
Programmer parameter window (displayed to the right of the action log window)	Displays programming parameter settings.
Status bar	Displays status.

8.3 Toolbar

The toolbar contains buttons for starting the important procedures of the WriteEZ3.

Figure 38: Toolbar Buttons

	[Device] → [Setup] button
	[File] → [Load] button
	[Device] → [Blank Check] button
	[Device] → [Erase] button
	[Device] → [Program] button
	[Device] → [Verify] button
	[Device] → [Autoprocedure(EPV)] button

8.4 Menu Bar

Depending on the actual device status and device type, some menu items may be enabled or disabled.

8.4.1 [File] menu

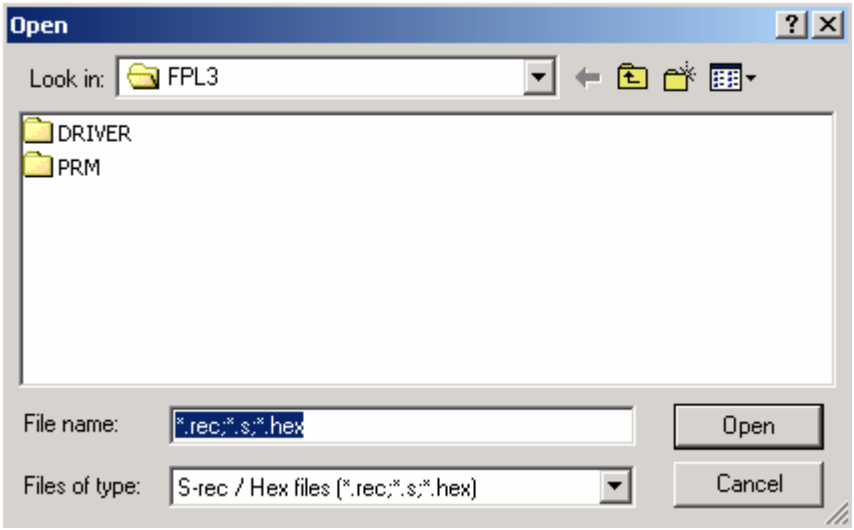
Clicking the [File] menu displays the pull-down menu as shown below.
This menu mainly contains commands related to file operation.

Figure 39: [File] Menu

(1) [Load] command

The [Load] command allows you to select a program file.
The selected program file is programmed into the flash memory of the device by executing the [Program] command or [Autoprocedure(EPV)] command.

Figure 40: HEX File Selection Window



The file selection window for program loading displays the most recently used directory to which a user program has been loaded. After a user program is loaded, a checksum calculation is made and the result is displayed in the programmer parameter window.

[Open button]
Selects a user program as a program to be written to the target device.

[Cancel button]
Closes the window without selecting a program.

(2) [Quit] command

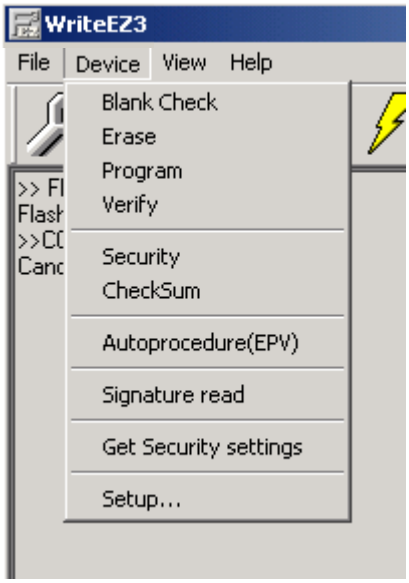
The [Quit] menu is the command for terminating the WriteEZ3 GUI software. Clicking ☒ on the right side of the task bar also terminates the WriteEZ3 GUI software.
User settings are saved in the WriteEZ3.INI[Note] file, so that the GUI software starts up next time with the same settings.

Note WriteEZ3.INI is created in the Windows folder when Windows 98SE, Windows Me, or Windows XP is used.
When Windows 2000 is used, WriteEZ3.INI is created in the Winnt folder.

8.4.2 [Device] menu

Clicking the [Device] menu displays the pull-down menu as shown below.
This menu mainly contains commands for programming operations such as deletion, programming, and verification on the target device.

Figure 41: [Device] Menu



(1) [Blank Check] command

The [Blank Check] command allows you to make a blank check on the target device connected to the WriteEZ3. If the flash memory of the target device is erased, a blank check is terminated normally. If the flash memory is not completely erased, the indication "not blank" is provided. Before starting programming, erase the flash memory of the target device.

(2) [Erase] command

The [Erase] command erases the flash memory of the target device connected to the WriteEZ3. While the flash memory is being erased, the progress status is displayed in the action log window to indicate programmer operation.
The execution on the [Blank Check] command before the [Erase] command is executed follows the setting of 'Command options' of the Advance tab displayed by selecting [Device] → [Setup].
Upon completion of [Erase] command execution, the GUI software displays the result of executing the command on the target device.

(3) [Program] command

The [Program] command sends a specified user program to the target device and writes the program to the flash memory.
The execution of Verify operation for detecting an error in user program communication from the WriteEZ3 to the target device after the execution of the [Program] command follows the setting of the 'Command options' on the Advance tab displayed by selecting [Device] → [Setup].
During programming, the progress status is displayed in the action log window to indicate programmer operation. This progress status display window displays the progress status on target device programming by percentage.
Upon completion of [Program] command execution, the GUI software displays the result of executing the command on the target device.

(4) [Verify] command

The [Verify] command sends a specified user program to the target device connected with the WriteEZ3, and performs verification against the data written to the flash memory of the target device.
During verification, the progress status is displayed in the action log window to indicate programmer operation. This progress status display window displays the progress status of target device verification by percentage.
Upon completion of [Verify] command execution, the GUI software displays the result of executing the command on the target device.

(5) [Security] command

The [Security] command initiates the programming of the security flag of the target device connected to the WriteEZ3. Set 'Security flag settings' on the Advance tab of the [Device] > [Setup…] menu.

(6) [Checksum] command

The [Checksum] command reads the checksum value of the target device connected with the WriteEZ3.
This value differs from the value displayed in the parameter window of the main window.

(7) [Autoprocedure(EPV)] command

The [Autoprocedure(EPV)] command executes the [Erase] command, [Program] command and [Verify] command in succession.
When a user program is to be resent to the target device for comparison with the data written to the flash memory of the target device because of a user program communication error, execute the [Program] command by selecting [Device] → [Setup] and specifying 'Command options' on the Advance tab, then set the automatic execution of the [Verify] command.
During EPV execution, the progress status is displayed in the action log window to indicate programmer operation. For a selected command, its execution operation, and messages, refer to **CHAPTER 9 HOW TO USE WRITEEZ3**.
Upon completion of [Autoprocedure(EPV)] command execution, the GUI software displays the result of executing the command on the target device.

(8) [Signature read] command

The [Signature read] command reads the signature information (device name, flash memory information, and so forth) of the target.

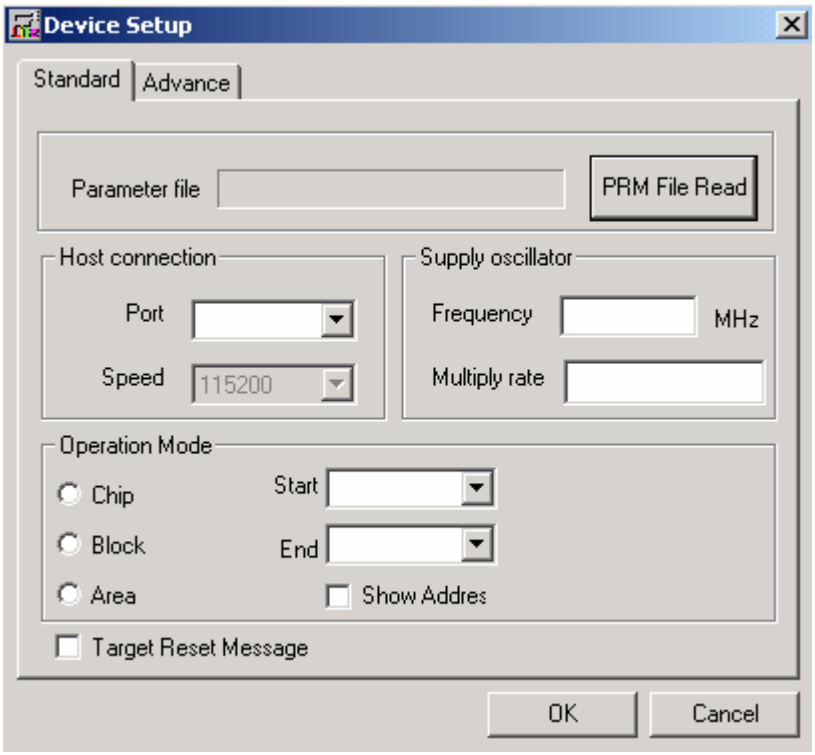
(9) [Setup] command

The [Setup] menu allows you to make settings related to flash memory rewriting according to the user environment and to set command options. Each time the GUI software is started, the most recently used parameter file (.PRM) is read and the settings are displayed. The [Setup] menu allows you to modify the settings of items other than those items consisting of shadowed characters according to the user environment.

(a) Standard setup

This menu is used to set the environment for rewriting the flash memory of the target device.
The mode of communication with the target, the operating clock, and so forth differ depending on the device used. For details, refer to the manual of the device used, when making settings.
The window shown below is opened.

Figure 42: Device Setup Window - Standard



This window shows all basic options that can be set in accordance with the user environment and target device.

[OK button]
Clicking the OK button saves the settings on the Standard and Advance menus and closes the window.

[Cancel button]
Clicking the Cancel button closes the window without saving the settings on the Standard and Advance menus.

<1> Parameter file

This file holds parameters and timing data required to rewrite the flash memory of the target device. Do not modify the data in the parameter file because the data is related to the guarantee of rewrite data.

The parameter file is protected by the checksum function. If the checksum result indicates an error, the WriteEZ3 does not accept the parameter file.

Figure 43: Device Setup Window - Parameter File Selection

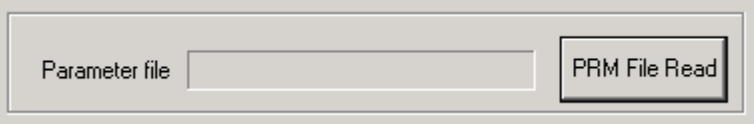
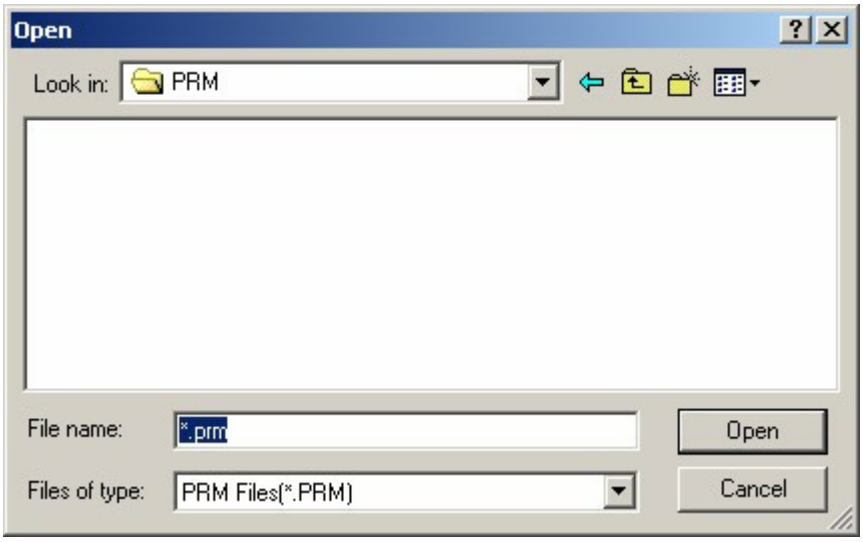


Figure 44: Parameter File Selection Window



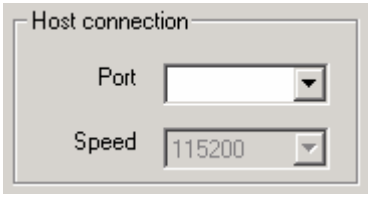
[PRM File Read button]

A window for specifying a parameter file is displayed. Specify a desired file then click Open.

<2> Host connection

"Host connection" is used to select a channel for communication between the *78K0/Lx3 – See it!* board and host machine.

Figure 45: Device Setup Window – Host connection



[Port list box]

Select a channel for communication between the *78K0/Lx3 – See it!* board and host machine.

- COM1 to COM256

Remark Selectable ports can be checked using Device Manager. For details, refer to **CHAPTER 7.6 Confirmation of USB Driver Installation**.

[Speed list box]

Select a communication rate for the selected communication channel from the following:

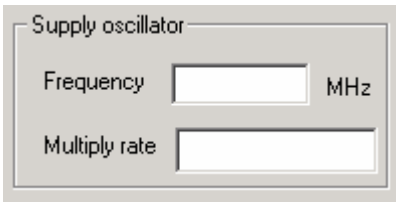
- 9600 bps
- 19200 bps
- 38400 bps
- 115200 bps

Remark For selectable communication rates, refer to the user's manual of the device used.

<3> Supply oscillator

"Supply oscillator" is used to select a clock that determines programming, data transfer, and a transfer rate.

Figure 46: Device Setup Window - Supply Oscillator Selection



[Frequency box]

Sets the clock frequency of the target system.

The range of operating frequency varies from one device to another. So, check the specifications of the device used before making a setting.

[Multiply rate]

Specifies the division rate or multiplication rate of the target device.

If the target device has an on-chip PLL circuit, enter a division rate or multiplication rate according to the use environment.

The selectable division rate or multiplication rate differs depending on the device. Check the specifications of the device used before making a setting.

If the target device does not have an on-chip PLL circuit, select "1.0".

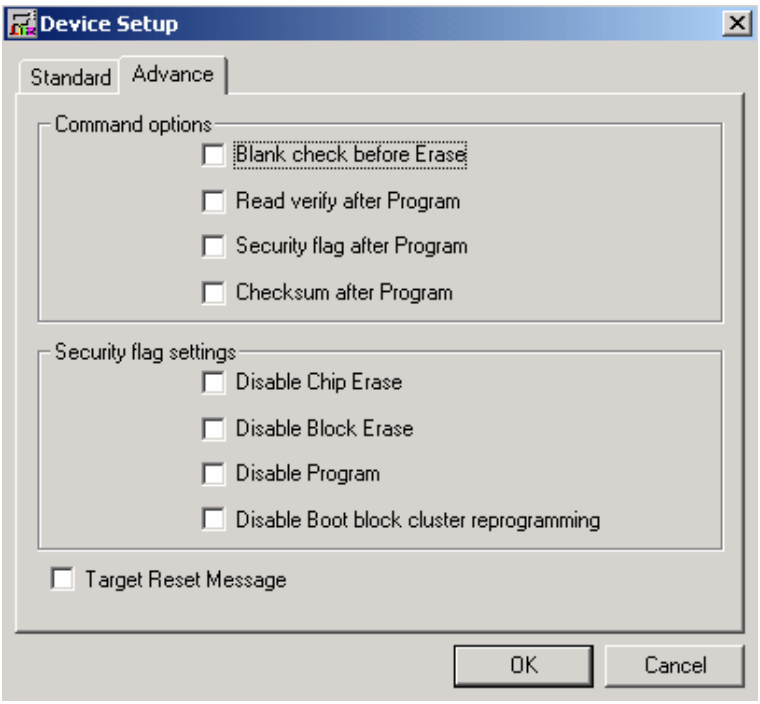
On the initial screen, the default setting is displayed according to the parameter file.

(b) Advance setup

The Advance setup menu is used to specify the command options and security flag settings.

When "Advance" is clicked, the following window is displayed:

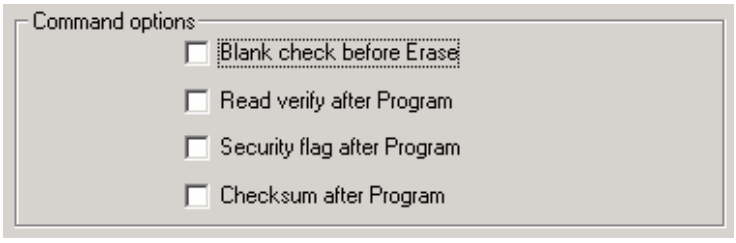
Figure 49: Device Setup Window - Advance



<1> Command options

This dialog box is used to specify the WriteEZ3 flash processing command options.

Figure 50: Device Setup Window - Command options



[Blank check before Erase check box]

If this check box is checked, blank check is made before the Erase command or EPV command is executed.

If the result of a blank check indicates OK, erase processing is not executed.

[Read verify after Program check box]

If this check box is checked, write data is sent from the programmer after execution of the Program command and EPV command, then the data is verified against the data written to the flash memory.

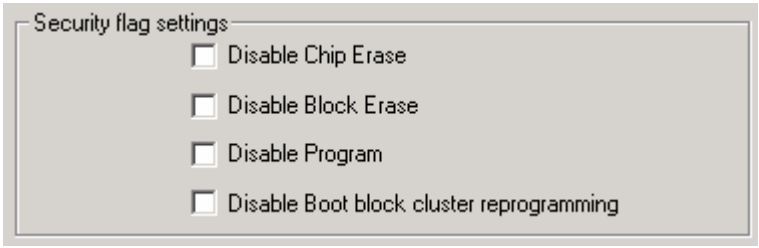
[Security flag after Program check box]

If this check box is checked, automatic programming of the selected security flag is executed after execution of the [Program] and [Autoprocedure (EPV)] commands.

[Checksum after Program check box]
If this check box is checked, the flash memory checksum value of the target device is read from the target device after execution of the Program command and EPV command.
This value differs from the value displayed in the parameter window of the main window.

<2> Security flag settings
The <Security flag settings> dialog box is used to specify which security function is valid.

Figure 51: Device Setup Window – Security flag settings



Caution: The following is the correspondence between the [Erase] and [Program] Commands when the security functions of a 78K0/LF3 microcontroller are valid!

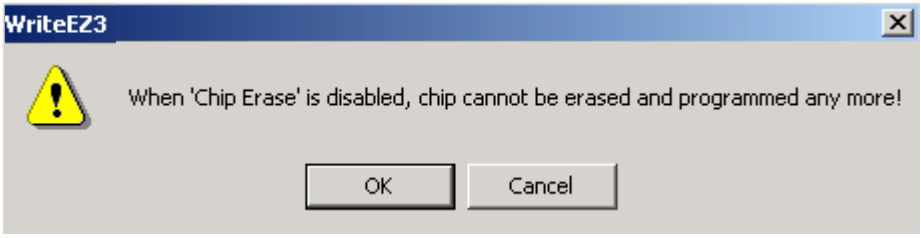
	Chip Erase Command	Block Erase Command	Program Command
Disable Chip Erase	Invalid	Invalid	Valid (Note1)
Disable Block Erase	Valid	Invalid	Valid
Disable Program	Valid	Invalid	Invalid
Disable Boot block cluster reprogramming	Invalid	Valid (Note2)	Valid (Note2)

Notes 1: Since the [Erase] command is invalid, the data that differs from the data already written in the flash memory cannot be written.

Notes 2: Valid only for the area other than the area specified as the boot area

[Disable Chip Erase check box]
If this check box is checked, the [Erase] command becomes invalid in the entire flash memory area of the target device.
At this time, the warning message shown below is displayed.

Figure 52: Device Setup Window – Disable Chip Erase



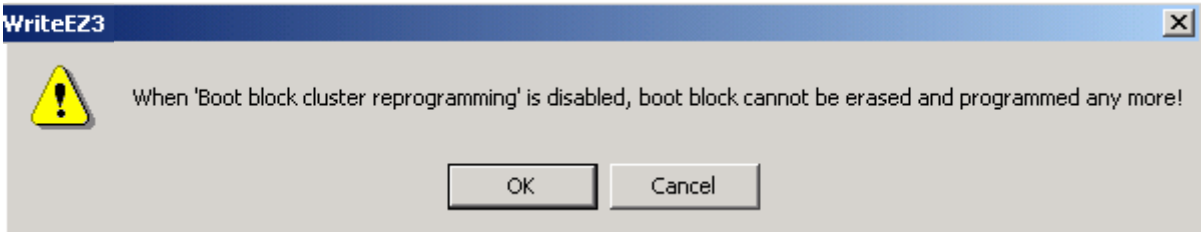
Caution: Be aware that if the security flag is set in the target device, neither erasing nor writing to the device can be enabled afterward!!!

[Disable Block Erase check box]
If this check box is checked, the [Erase] command becomes invalid in all the blocks of the flash memory selected under Operation Mode in the Standard Setup menu. This setting is cleared by the [Erase] command when Chip was selected under Operation Mode.

[Disable Program check box]
If this check box is checked, the [Program] command becomes invalid, as does the [Erase] command in all the blocks of the flash memory selected under Operation Mode in the Standard Setup menu.
The [Erase] command for the entire flash memory area is valid. This setting is cleared by the [Erase] command when Chip was selected under the Operation Mode.

[Disable Boot block cluster reprogramming check box]
If this check box is checked, the boot area is set with the boot block set in the Boot block Cluster setting as the last block. At this time, the warning message shown below is displayed.

Figure 53: Device Setup Window – Disable Boot Cluster Reprogramming warning

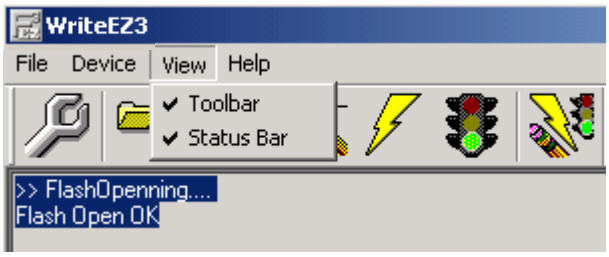

WriteEZ3
When 'Boot block cluster reprogramming' is disabled, boot block cannot be erased and programmed any more!
OK
Cancel

Caution: Be aware that if the security flag is set in the target device, the boot area cannot be rewritten to the device afterward!!!

8.4.3 [View] menu

Clicking the [View] menu displays the pull-down menu shown below.
This menu contains commands for setting whether to display the toolbar and status bar.

Figure 54: [View] Menu



(1) [Toolbar] command

Checking the [Toolbar] command displays the toolbar. Unchecking the command hides the toolbar.

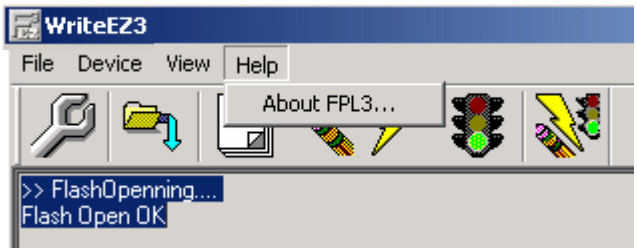
(2) [Status Bar] command

Checking the [Status Bar] command displays the status bar. Unchecking the command hides the status bar.

8.4.4 [Help] menu

Clicking the [Help] menu displays the following pull-down menu:

Figure 55: [Help] Menu

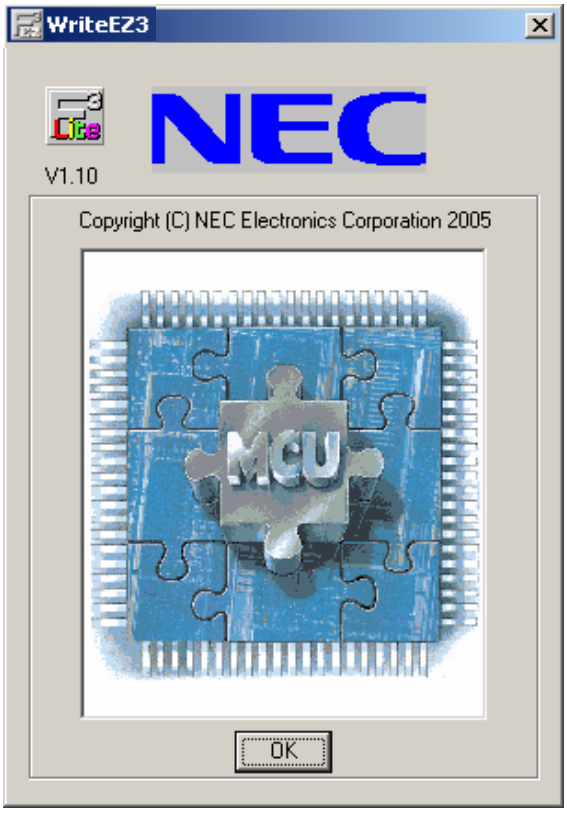


(1) [About WriteEZ3] command

The [About WriteEZ3] command opens the program entry window as shown below and indicates the version.

Clicking OK terminates the display.

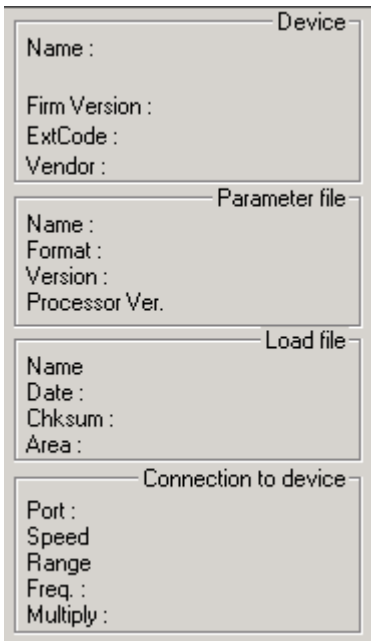
Figure 56: About WriteEZ3 Window



8.5 Programmer Parameter Window

This window displays the settings of the programming parameters.

Figure 57: Programmer Parameter Window



[Device]
Updated after communication with the target device to display information about the target device.

[Parameter file]
Updated after [Setup] command execution to display information about a read parameter file.

[Load file]
Updated after [Load] command execution to select information about a selected program file.

[Connection to device]
Updated after [Setup] command execution to display information about the connection with the target device.

9. How to use WriteEZ3 FLASH programming software

This chapter explains the basic operation of the WriteEZ3 GUI for programming the *78K0/Lx3 - See it!* board. This chapter covers how to start the system, execute the EPV command, and program the target device. On the following pages the FLASH programming of the 78K0/LF3 via WriteEZ3 is shown.

The conditions of the series of operations described in this chapter are as follows:

Hardware configuration of *78K0/Lx3 - See it!*:

Base board : *78K0/Lx3 - See it!*
Target device : 78K0/LF3 (μPD78F0495)
Clock : 6 MHz
Voltage level : 5 V

Software configuration of WriteEZ3:

Parameter file: 78F0495.PRM
Clock setting : 6 MHz Multiplied by 1
Port : COM3 (115200 bps)
Operation mode: Chip
Write HEX : VOLTMETER.hex
Option setting : Blank check before Erase

(1) Installing the WriteEZ3 GUI software

Install the WriteEZ3 GUI software on the host machine you are using, by referring to **CHAPTER 7 SOFTWARE INSTALLATION** (if the software has not been installed yet).

(2) Installing the driver

Install the USB driver on the host machine you are using, by referring to **CHAPTER 7 SOFTWARE INSTALLATION** (if the driver has not been installed yet).

(3) Installing the parameter file

The parameter file for the 78K0/LF3 device are installed automatically during installation of WriteEZ3 GUI, folder <WriteEZ3 install-path>\PRM. Nevertheless, newest version of parameter file for the μPD78F0495 device can by download from the NEC Electronics Web site.

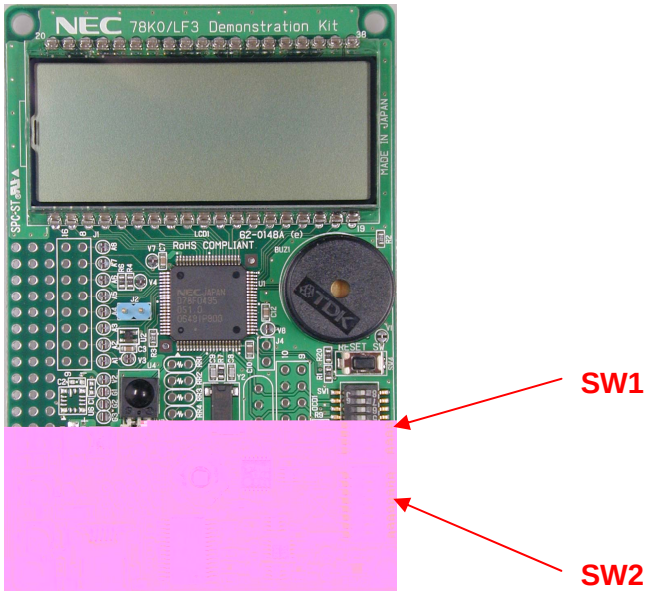
Download the parameter file for the PG-FP4 from the following NEC Electronics Web site:

http://www.eu.necel.com/updates

Copy the parameter file downloaded from the NEC Electronics Web site into sub-directory <WriteEZ3.EXE-install-path>\PRM created during GUI software setup (refer to **CHAPTER 7 SOFTWARE INSTALLATION**)..

(4) Connecting and starting

<1> Set the *78K0/Lx3 - See it!* board to the WriteEZ3 FLASH programming mode by switching SW1 and SW2 to the following setting:

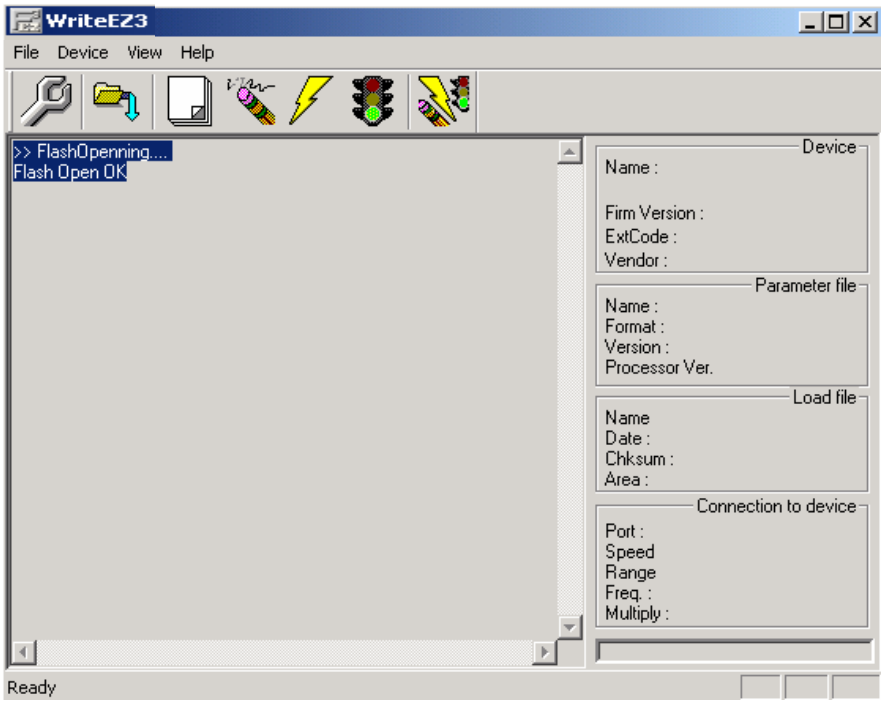


Mode	SW2								SW1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
FPL3 (WriteEZ3)			ON	ON	don't care				ON	ON					ON	ON
	OFF	OFF									OFF	OFF	OFF	OFF		

<2> <Plug and Play> Connect the *78K0/Lx3 - See it!* board with the host machine via the USB cable. If the connection was already done, press the reset button SW4 to release the FLASH programming mode.

<3> Start the WriteEZ3 GUI.

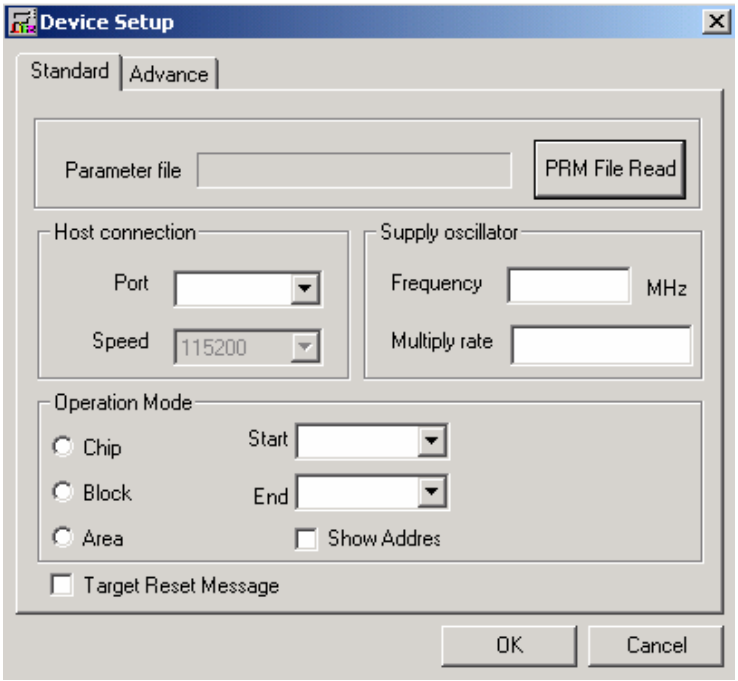
Figure 58: GUI Software Startup Screen



(5) Setting the programming environment

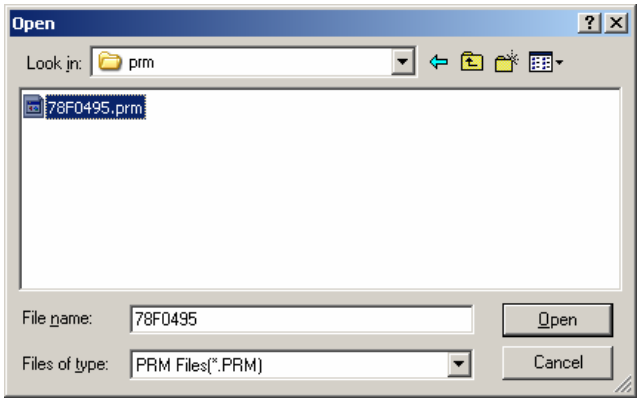
<1> Select [Device] → [Setup] from the menu bar.
<2> The Standard dialog box for device setup is activated.

Figure 59: <Standard Device Setup> Dialog Box



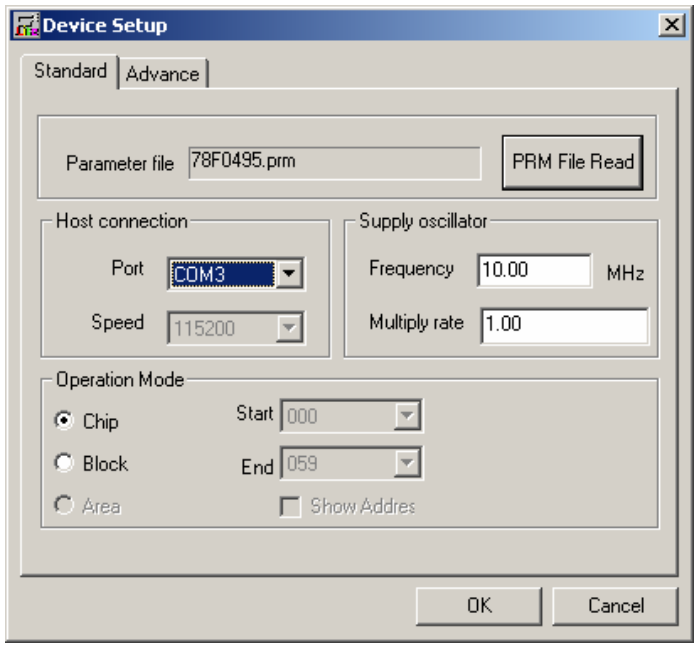
<3> Click PRM File Read to open the parameter file selection window.
Select the parameter file “78F0495.prm” then click Open.

Figure 60: Parameter File Selection



<4> From the Port list box, select the communication port that matches the host machine being used. Select the communication speed of the Host connection.

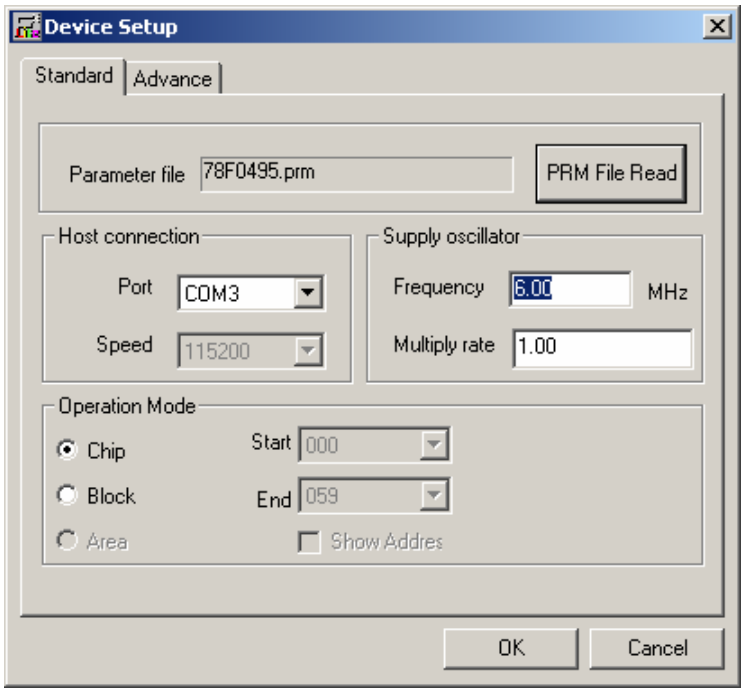
Figure 61: Port Selection



Remark Selectable ports can be checked using Device Manager. For details, refer to **7.6 Confirmation of USB Driver Installation**.

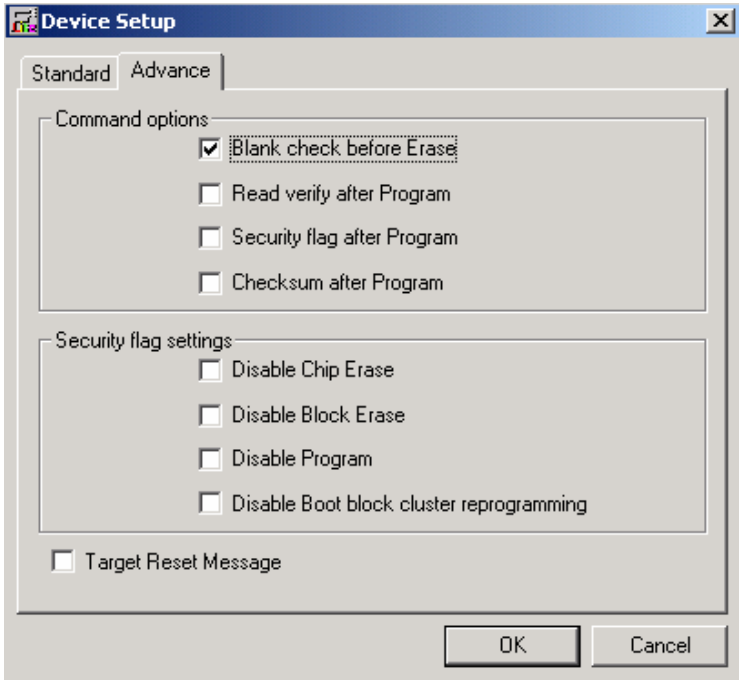
<5> Set "Supply oscillator" according to the specifications of the *78K0/Lx3 - See it!* board, “Frequency = 6.00 MHz” and “Multiply rate = 1.00”. In "Operation Mode", please specify the “Chip” mode. The following figure shows the recommended settings:

Figure 62: <Standard Device Setup> Dialog Box after Setting



<6> Switch to the Advance dialog box.

Figure 63: <Advance Device Setup> Dialog Box

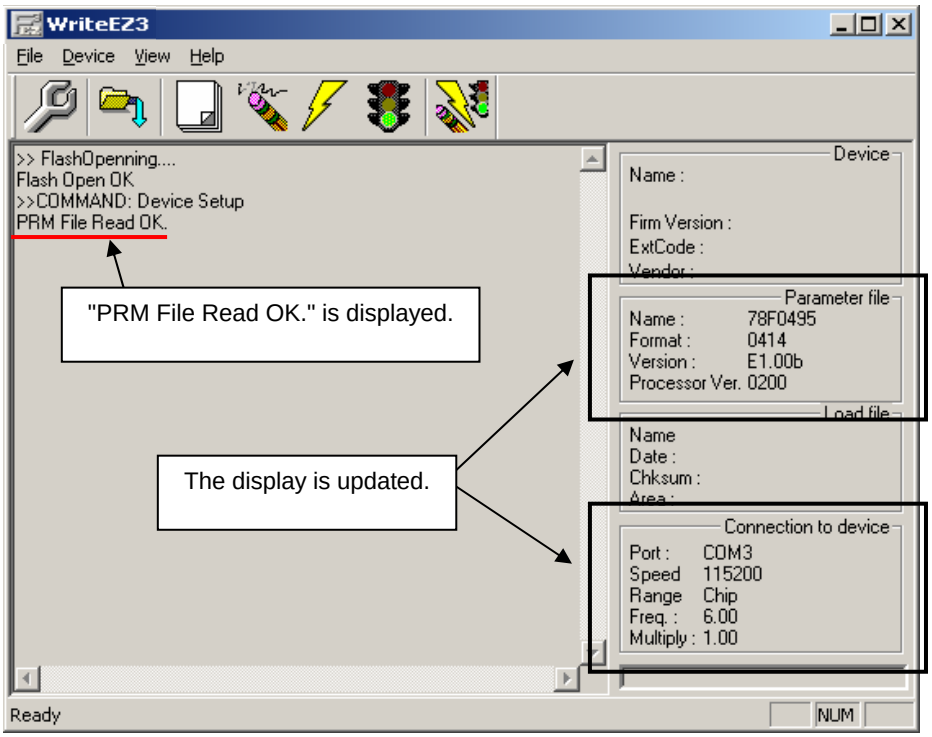


<Command options>

Blank check before Erase : Checked

<7> Click the OK button. The GUI software sets the parameters.
When the settings have been completed, the following screen is displayed:

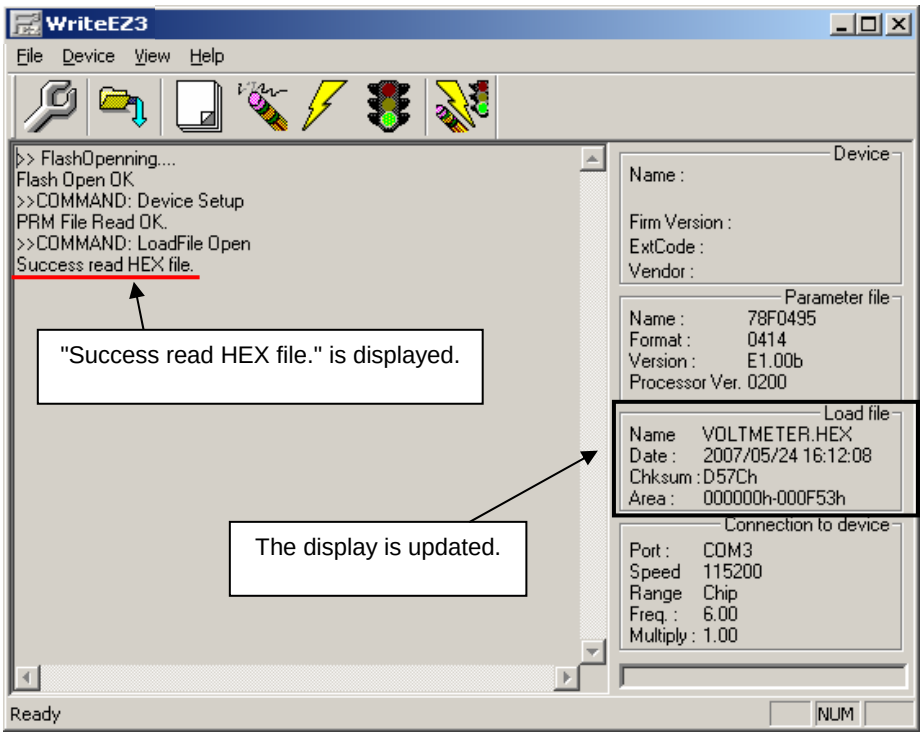
Figure 64: Completion of Parameter Setting



(6) Selecting a user program

<1> Select [File] → [Load].
<2> Select a program file to be written to the target device, then click Open.

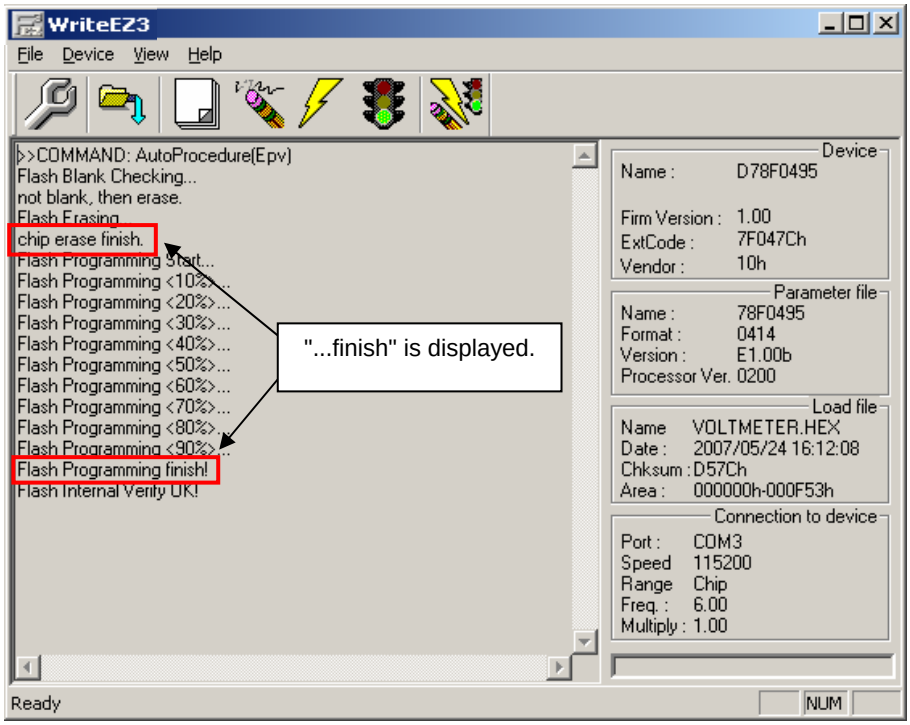
Figure 65: After Downloading



(7) [Autoprocedure(EPV)] command execution

Select [Device] → [Autoprocedure(EPV)] from the menu bar.
When the [Autoprocedure(EPV)] command is executed, Blank Check → Erase → Program and FLASH Internal Verify are executed sequentially for the μPD78F0495 device.

Figure 66: After EPV Execution



(8) Terminating the GUI

Select [File] → [Quit] to terminate the GUI software. All settings executed so far are saved in the WriteEZ3.INI file, so that those settings can be reused when the GUI software is restarted.

(9) Execute the "VOLTMETER" application

Set the *78K0/Lx3 - See it!* board to the normal operation mode (QB-MINI2 mode). < Plug and Play> the *78K0/Lx3 - See it!* board to start in normal operation mode or press the reset button SW4 to release the normal operation mode.

(10) Restarting the GUI

When the system is restarted, the same screen as shown in Figure 65: After Downloading appears.

10. TROUBLESHOOTING

In driver installation, recognition based on Plug and Play is disabled.

Cause:
The USB connector may not be inserted normally into the USB port of the personal computer.
Action:
Check that the USB connector is inserted fully into the USB port of the personal computer. Alternatively, disconnect the USB connector, then insert the USB connector again after a while.

The driver file cannot be found at a specified location.

Cause:
The WriteEZ3 FLASH programming software may not be installed correctly.
Action:
Install the GUI software again by referring to **CHAPTER 7 Software Installation**.

In checking by Device Manager, "USB Serial Port" or "USB High Speed Serial Converter" is not displayed. Alternatively, the "!" or "×" is prefixed.

Cause:
The USB connector may not be inserted normally into the USB port of the personal computer.
Action:
Check that the USB connector is inserted fully into the USB port of the personal computer. Alternatively, disconnect the USB connector from the USB port, then insert the USB connector again after a while.

Cause:
The driver may not be installed correctly.
Action:
<1> When this product is connected to the personal computer, right-click the driver marked with "!" or "×".
Click Erase when displayed.
<2> On Device Manager, execute [Hardware Modification Scan].
<3> Install the driver again with Plug and Play.

Cause:
The device may not be recognized (in the case of connection with the USB hub).
Action:
Try the following:
- Disconnect the USB connector, then insert the USB connector again.
- Connect the USB connector to another port of the USB hub.

If the same symptom occurs, do not use the USB hub, but directly connect the connector to the USB port of the personal computer.

When this product is connected with a personal computer, the "Add New Hardware Wizard" screen is displayed.

Cause:
If the USB connector of this product is not inserted into the USB port used at the installation time but into another USB port, this product may be recognized as a new hardware item.
Action:
Install the driver by referring to **CHAPTER 7.5 USB Driver Installation**.

Communication with the *78K0/Lx3 - See it!* board is disabled.

Cause:
The driver may not be installed correctly.
Action:
Check if "USB Serial Port" and "USB High Speed Serial Converter" are installed correctly by referring to **CHAPTER 7.5 USB Driver Installation**.

Cause:
The COM port selected via the “Port list box” within device setup menu of WriteEZ3 may not be set correctly.
Action:
Set the port checked using Device Manager.

Cause:
The *78K0/Lx3 - See it!* board is operating in normal mode.
Action:
Set the board to the WriteEZ3 FLASH programming mode.

Cause:
The PRM file selected in [Device Setup] may be incorrect.
Action:
Use the corresponding PRM file that matches the target device. For information about the PRM file, refer to **CHAPTER 8 WRITEEZ3 FLASH programming software.**

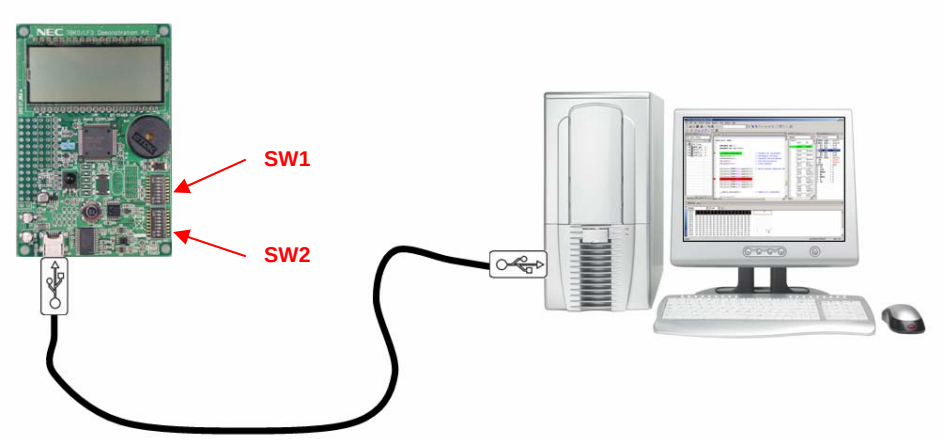
Cause:
The setting of "Supply oscillator" in [Device Setup] may be incorrect.
Action:
Make a correct setting according to the specifications of the target device.

11. IAR sample session

Before using the On-Board debug function of the *78K0/Lx3 - See it!* board together with the IAR C-SPY debugger it is necessary to install the USB driver first. The communication between the starterkit and the IAR C-SPY debugger - that is running on the personal computer - is done via the standard UART / USB connection.

To operate the *78K0/Lx3 - See it!* board within the TK-78 On-Board debug mode configure switches SW1 and SW2 as following:

Mode	SW2								SW1							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
On-Board Debug	ON	ON			don't care				ON	ON	ON	ON	ON	ON		
			OFF	OFF											OFF	OFF



TK-78 debugging via
On-Board debug function

When everything is set up correctly the IAR Embedded Workbench can be started. To do so, start the Embedded Workbench from Windows “Start” menu > “Programs” > folder “IAR Systems” > “IAR Embedded Workbench Kickstart for 78K”. The following screen appears:

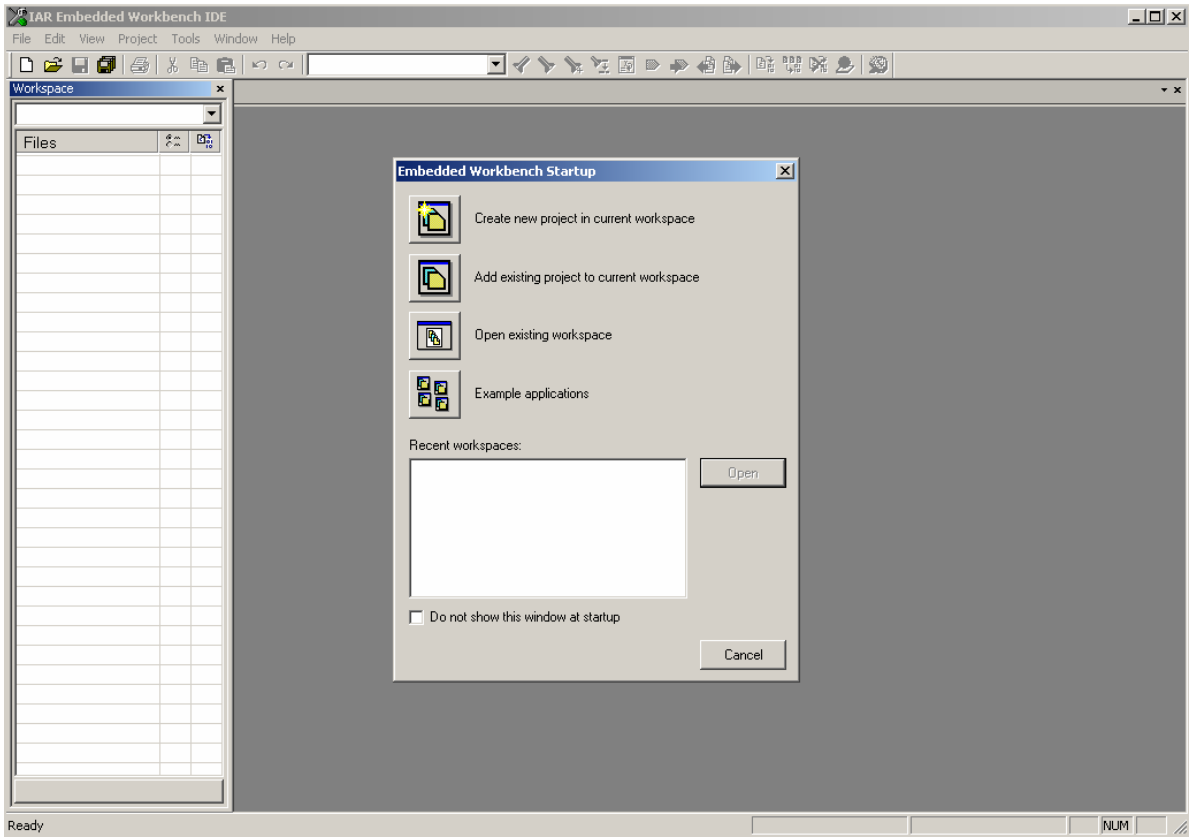


Figure 67: IAR Embedded Workbench

Now select the option “Open exiting workspace” from the “File” menu and locate the sample project. Open the file “78K0LX3_SEEIT_SAMPLES.eww”. This is the workspace file that contains general information about the demonstration projects and settings.

After the demo workspace has been opened the projects contained in the workspace are displayed. Now select the “voltmeter” demo project within the workspace window. To do so, please use the pull down menu within the workspace window and select “Voltmeter – Debug”. Click on the little “+” sign next to the “Voltmeter” project to show files that were part of the project. The screen should now look similar to this:

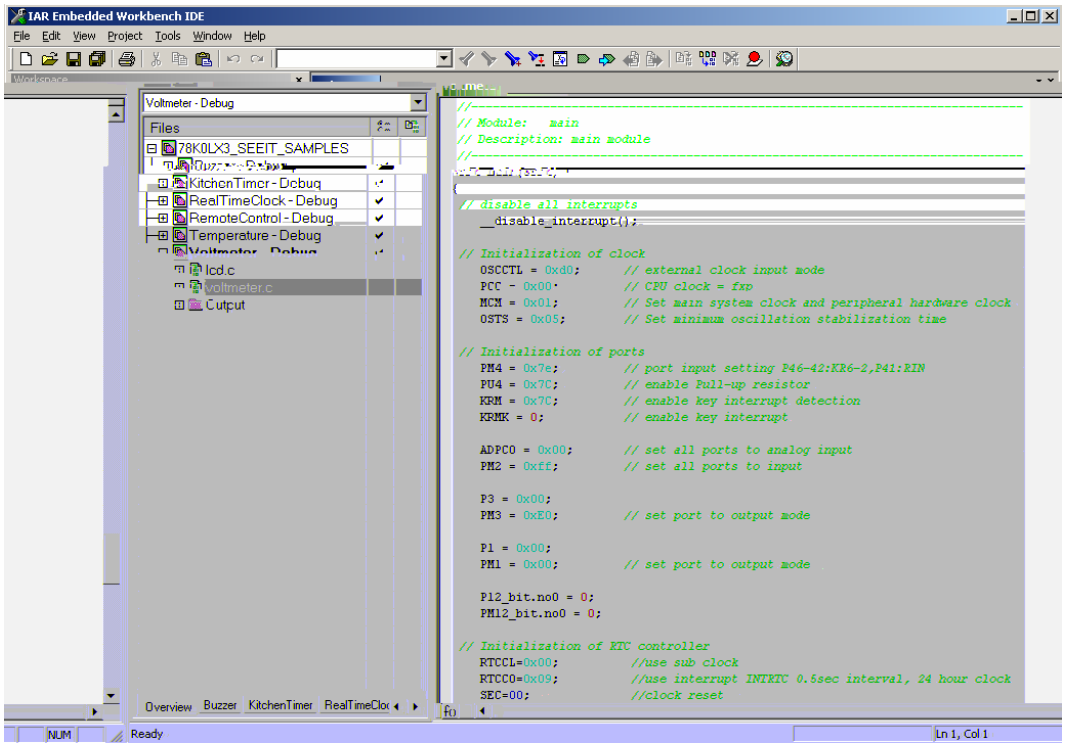


Figure 68: IAR project workspace

As a next step check some settings of the IAR Embedded Workbench that have to be made for correct operation and usage of the On-Board debug function of the *78K0/Lx3 - See it!* board. First highlight the upper folder called “Voltmeter – Debug” in the workspace window. Then select “Project” > “Options” from the pull-down menus. Next select the category “Debugger”. Make sure that the driver is set to “TK-78” in order to use the On-Board debug function of the *78K0/Lx3 - See it!* board. The device description file must be set to “io78F0495.ddf”.

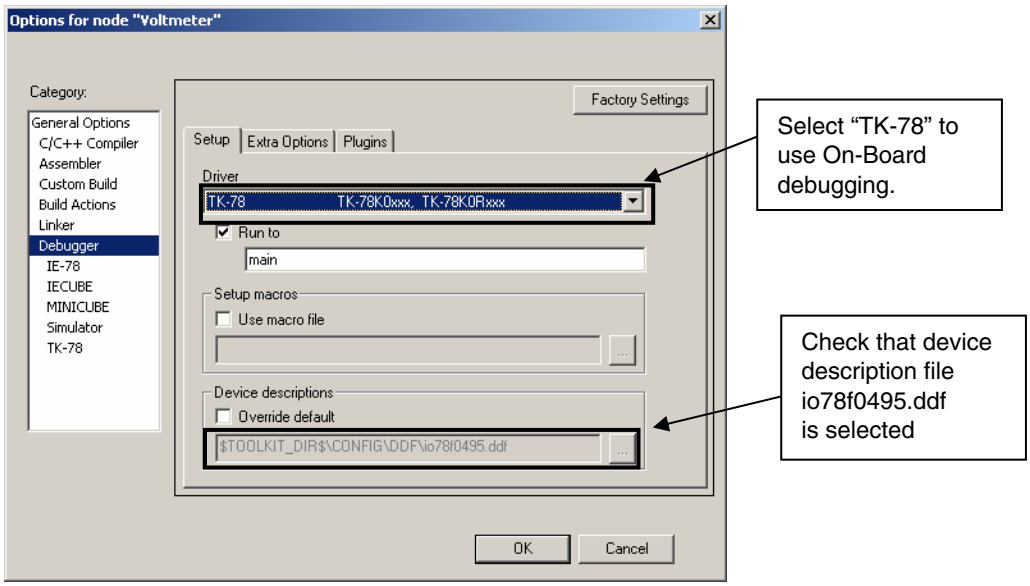


Figure 69: IAR debugger options 1/2

Before using the On-Board debug function it is necessary to set the corresponding USB serial COM port of the host computer where the *78K0/Lx3 - See it!* board is connected. To set the COM port, please select the category “TK-78” and choose the corresponding serial port.

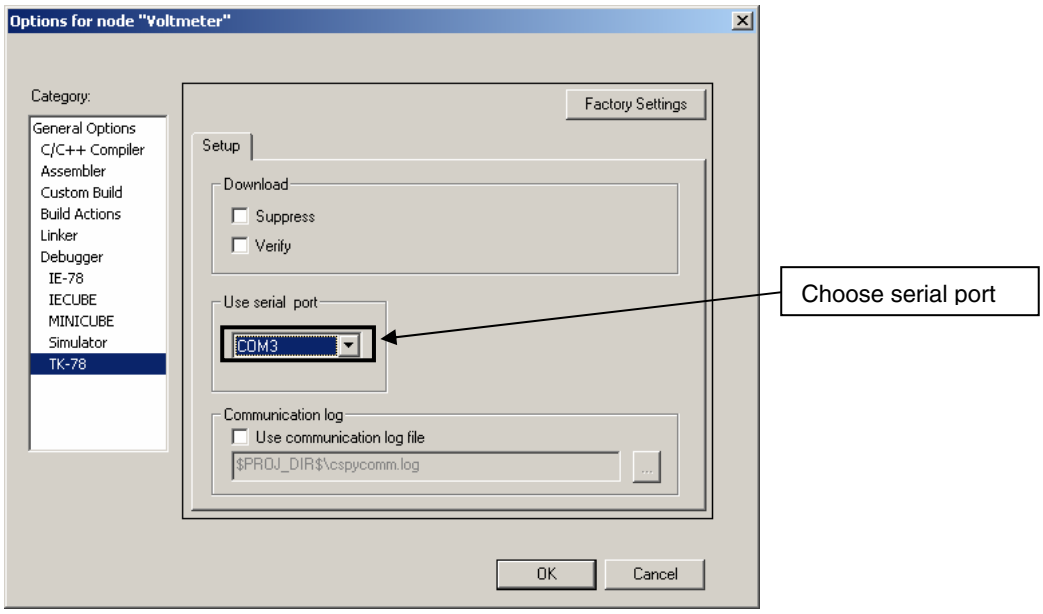


Figure 70: IAR debugger options 2/2

Next the correct linker settings of the demo project will be checked. This can be done in the “Linker” category as shown below. Select the “Config” tab and check that the linker command file “lnk78f0495.xcl” is selected. This file is used by the linker and contains information on where to place the different sections of code and data that may be used within the demo project.

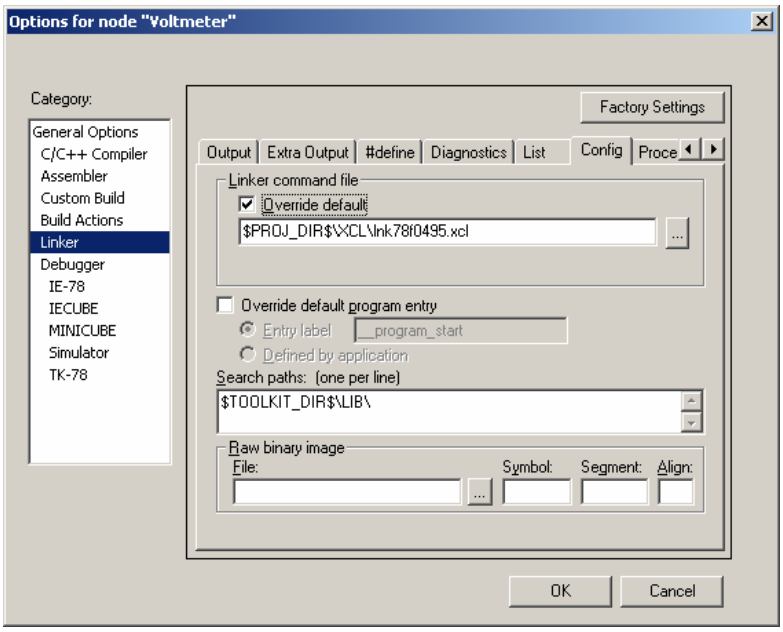


Figure 71: IAR Linker options

Now after everything has been setup correctly it's time to compile and link the demonstration project. Close the Options menu and select "Rebuild All" from the "Project" menu. If the project is compiled and linked without errors it can now be downloaded to the *78K0/Lx3 - See it!* board and debugged.

To start the IAR C-SPY debugger select the option "Debug" from the "Project" menu or press the ( ) "Debugger" button. In the next step the TK-78 Emulator has to be configured before downloading a new application. Press the OK button to enter the hardware setup menu. Set the configuration as show in the figure below and start the download by pressing the OK button.

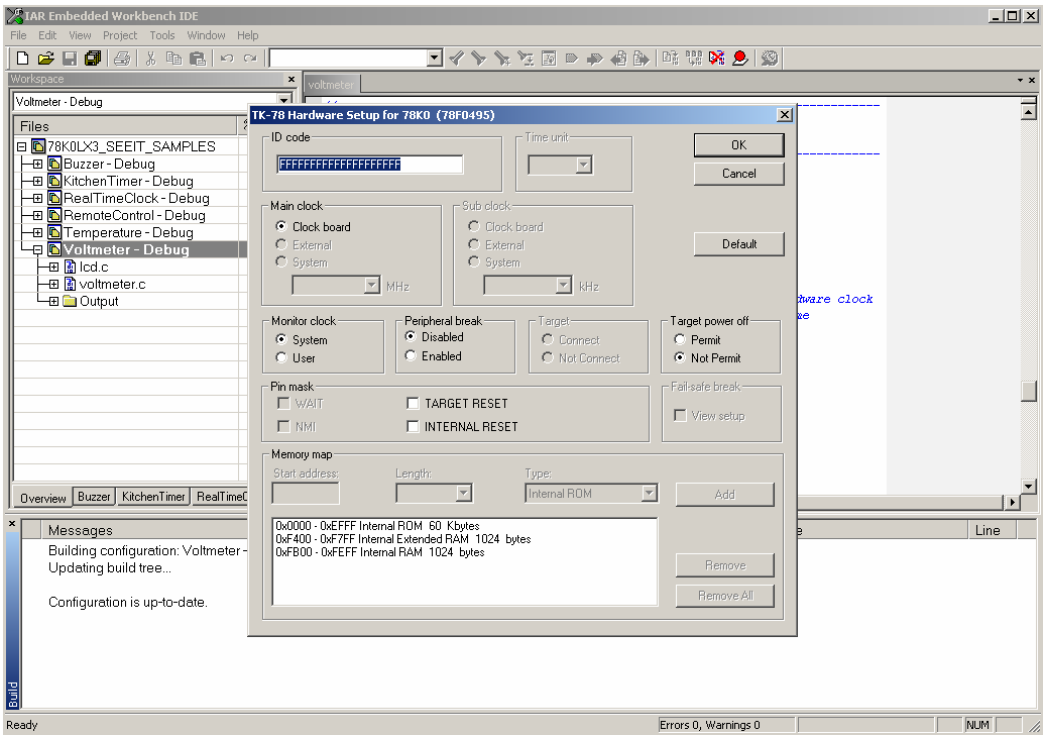


Figure 72: TK-78 hardware setup menu

Now the debugger is started and the demo project is downloaded to the *78K0/Lx3 - See it!* board. The progress of downloading is indicated by blue dots in the TK-78 Emulator window. Please note, downloading of larger executables can take some time.

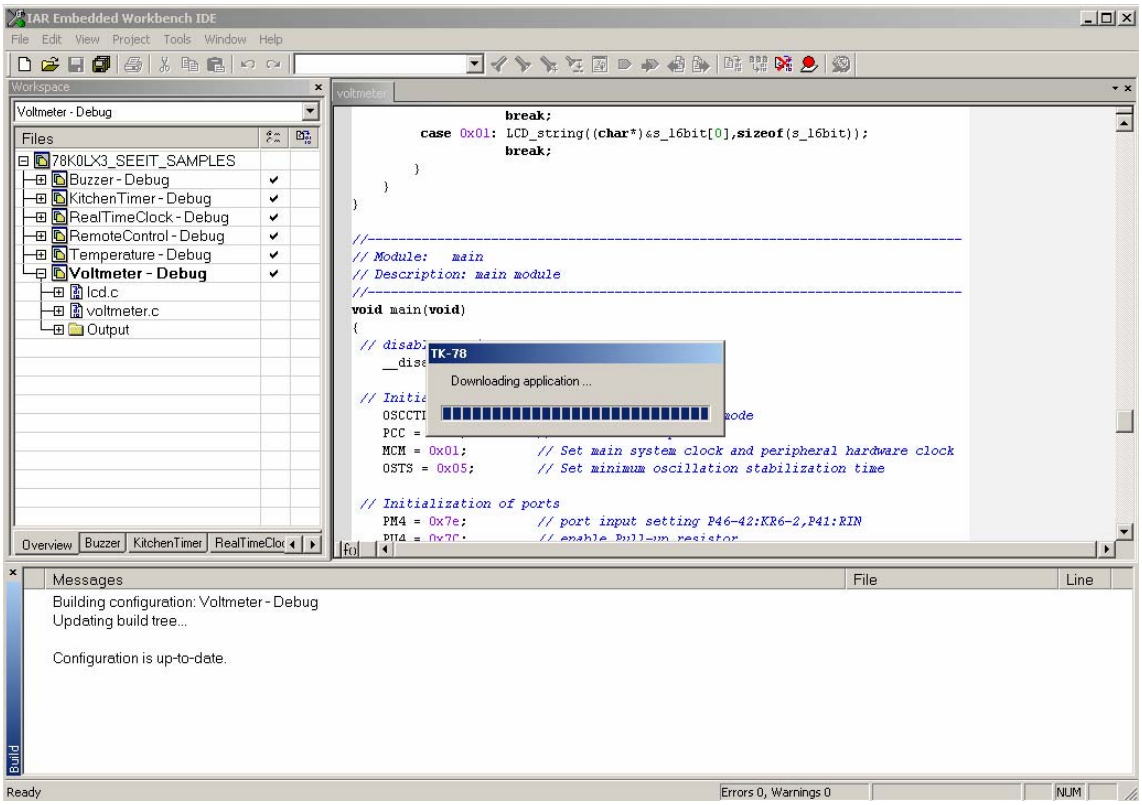


Figure 73: IAR project download

After the download was completed all debug features of IAR C-SPY debugger are available, i.e. Single Stepping (Step Over/-In/-Out), Go, Stop, Breakpoints, Register / Memory view etc.

To get more details on the debugger configuration and capabilities please refer to the “78K IAR Embedded Workbench IDE User Guide” of the IAR installation.

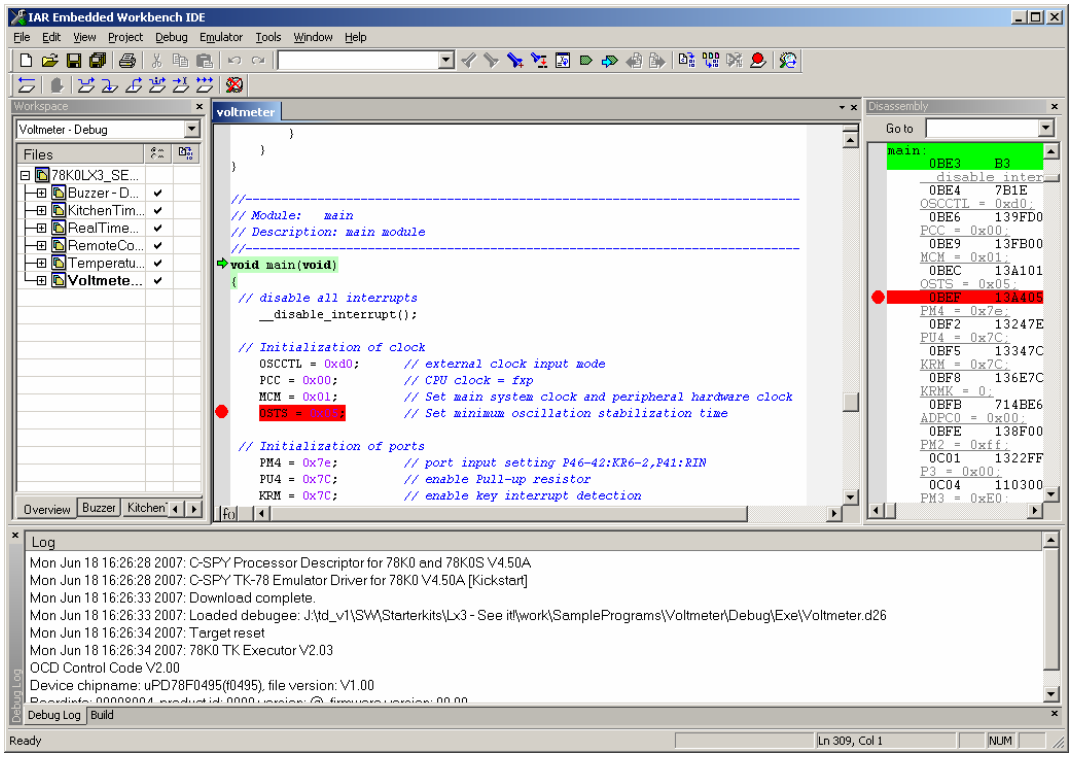

IAR Embedded Workbench IDE
File Edit View Project Debug Emulator Tools Window Help
Workspace
Voltmeter - Debug
Files
78K0LX3_SE...
Buzzer - D...
KitchenTim...
RealTime...
RemoteCo...
Temperatu...
Voltmete...
Overview Buzzer Kitchen
voltmeter
// Module: main
// Description: main module
void main(void)
{
// disable all interrupts
__disable_interrupt();
// Initialization of clock
OSCCTL = 0xd0; // external clock input mode
PCC = 0x00; // CPU clock = fxp
MCM = 0x01; // Set main system clock and peripheral hardware clock
OSTS = 0x05; // Set minimum oscillation stabilization time
// Initialization of ports
PM4 = 0x7e; // port input setting P46-42:KR6-2,P41:RIN
PU4 = 0x7C; // enable Pull-up resistor
KRM = 0x7C; // enable key interrupt detection
Disassembly
Go to
main:
0BE3 B3 disable inter
0BE4 7B1E OSCCTL = 0xd0;
0BE6 139FD0 PCC = 0x00;
0BE9 13FB00 MCM = 0x01;
0BEC 13A101 OSTS = 0x05;
0BEF 13A405 PM4 = 0x7e;
0BF2 13247E PU4 = 0x7C;
0BF5 13347C KRM = 0x7C;
0BF8 136E7C KRMK = 0;
0BFB 714BE6 ADPC0 = 0x00;
0BFE 138F00 PM2 = 0xff;
0C01 1322FF P3 = 0x00;
0C04 110300 PM3 = 0xE0;
Log
Mon Jun 18 16:26:28 2007: C-SPY Processor Descriptor for 78K0 and 78K0S V4.50A
Mon Jun 18 16:26:28 2007: C-SPY TK-78 Emulator Driver for 78K0 V4.50A [Kickstart]
Mon Jun 18 16:26:33 2007: Download complete.
Mon Jun 18 16:26:33 2007: Loaded debugee: J:\td_v1\SW\Starterkits\Lx3 - See it!\work\SamplePrograms\Voltmeter\Debug\Exe\Voltmeter.d26
Mon Jun 18 16:26:34 2007: Target reset
Mon Jun 18 16:26:34 2007: 78K0 TK Executor V2.03
OCD Control Code V2.00
Device chipname: uPD78F0495(f0495), file version: V1.00
Debug Log Build
Ready
Ln 309, Col 1
NUM

Figure 74: IAR C-SPY debugger

12. Sample Projects

Each of the sample programs is located in a single directory, which will be called main-directory of the sample. This main directory of a sample contains the complete project inclusive all output files of the development tool. The workspace file "**78K0LX3_SEEIT_SAMPLES.eww**" is located on top of the sample program directories. All sample programs use the same directory structure:

Buzzer	78K0/LF3 project and output files
Debug	debug output files for IAR C-SPY debugger
inc	C header files
Release	release output files, i.e. Intel HEX file
settings	configuration files, IAR Embedded Workbench
source	C source files
xcl	Linker control file
Buzzer.dep	dependency information file, IAR Embedded Workbench
Buzzer.ewd	project setting file, IAR C-SPY debugger
Buzzer.ewp	project file, IAR Embedded Workbench
KitchenTimer	78K0/LF3 project and output files
RealTimeClock	78K0/LF3 project and output files
RemoteControl	78K0/LF3 project and output files
Temperature	78K0/LF3 project and output files
Voltmeter	78K0/LF3 project and output files
78K0LX3_SEEIT_SAMPLES.eww	workspace file, IAR Embedded Workbench for 78K

Table 17: Example directory structure

The main directory contains only the project files for the IAR Systems Embedded Workbench for 78K. All source files are located in the directory `/source` and the `/inc` directory contains the header files. The `/xcl` directory contains the linker control file of the 78K0/LF3 device. Each sample project uses two targets. One target is the "Debug" (directory `/Debug`) that holds all information for debugging purpose and the other one the "Release" target (directory `/Release`) contains the programmable file, i.e. the Intel HEX file, for programming the 78K0/LF3 internal FLASH memory via the WriteEZ3 FLASH programmer software.

All output files of the development tools for the corresponding target are generated in the directories `/Debug` and `/Release`.

For details of using the IAR Embedded Workbench and the IAR C-SPY debugger please refer to the "78K IAR Embedded Workbench IDE User Guide".

12.1 Buzzer sample

This demonstration drives the buzzer by using the 16-Bit Timer/Event Counter 00. The timer is configured to generate a rectangle wave-form. By changing the output frequency of the timer, different tones can be generated by the buzzer. As demonstration a simple melody is played.

12.2 KitchenTimer sample

The kitchen timer functionality is realized by using the real time counter and the interrupt interval function. The setting of the kitchen timer count value and the cancellation of a started count process can be done by using the navigation switch. When the timer count time is elapsed the alarm symbol is displayed on the LCD and additional an alarm sound is played by using the buzzer.

12.3 RealTimeClock sample

This part of the sample projects realizes a Real-Time Clock. After the program is started the real time counter is initialized to generate an exact clock reference, based on the 32.768 kHz sub-clock. The actual time is displayed on the LCD panel. By using the navigation switch the time can be adjusted. Additionally two clock display modes can be chosen, the 24 hour mode or the AM/PM mode.

12.4 RemoteControl sample

The remote control sample is realized by using the IR receiver module that is equipped on the *78K0/Lx3 - See it!* board. The output terminal of the IR receiver (type RPM7138) is connected to the remote control input pin P41/KR1/RIN of the 78K0/LF3 device. By running the sample, custom code and data code in the NEC format that is transmitted by an external remote controller can be received. The received data is displayed alternately 16-bit wise on the LCD panel.

12.5 Temperature sample

The temperature measurement is realized by using the onboard temperature sensor IC (type S-8120C) and both A/D converters of the 78K0/LF3 device. Two display formats are supported degree centigrade (C) and degree Fahrenheit (F). The selection is done by using the navigation switch. Additionally two different A/D converter resolutions can be selected by using either the 10-bit successive approximation type A/D converter or the 16-bit delta sigma type A/D converter of the 78K0/LF3 device.

12.6 Voltmeter sample

By running the sample either the power supply voltage of the *78K0/Lx3 - See it!* board or an external voltage supplied to the connector J2 can be measured. Before applying external voltage to connector J2 please read the user's manual of the 78K0/LF3 device carefully to get information about the electrical specification of the A/D converter input port. For the power supply voltage measurement the input port P25/ANI5/DS2+ is used. For the external voltage measurement the input port P23/ANI3/DS1+ is reserved. The selection of the different measurement sources is done by using the navigation switch. Additionally two different A/D converter resolutions can be selected by using either the 10-bit successive approximation type A/D converter or the 16-bit delta sigma type A/D converter of the 78K0/LF3 device.

13. Cables

13.1 USB interface cable (Mini-B type)

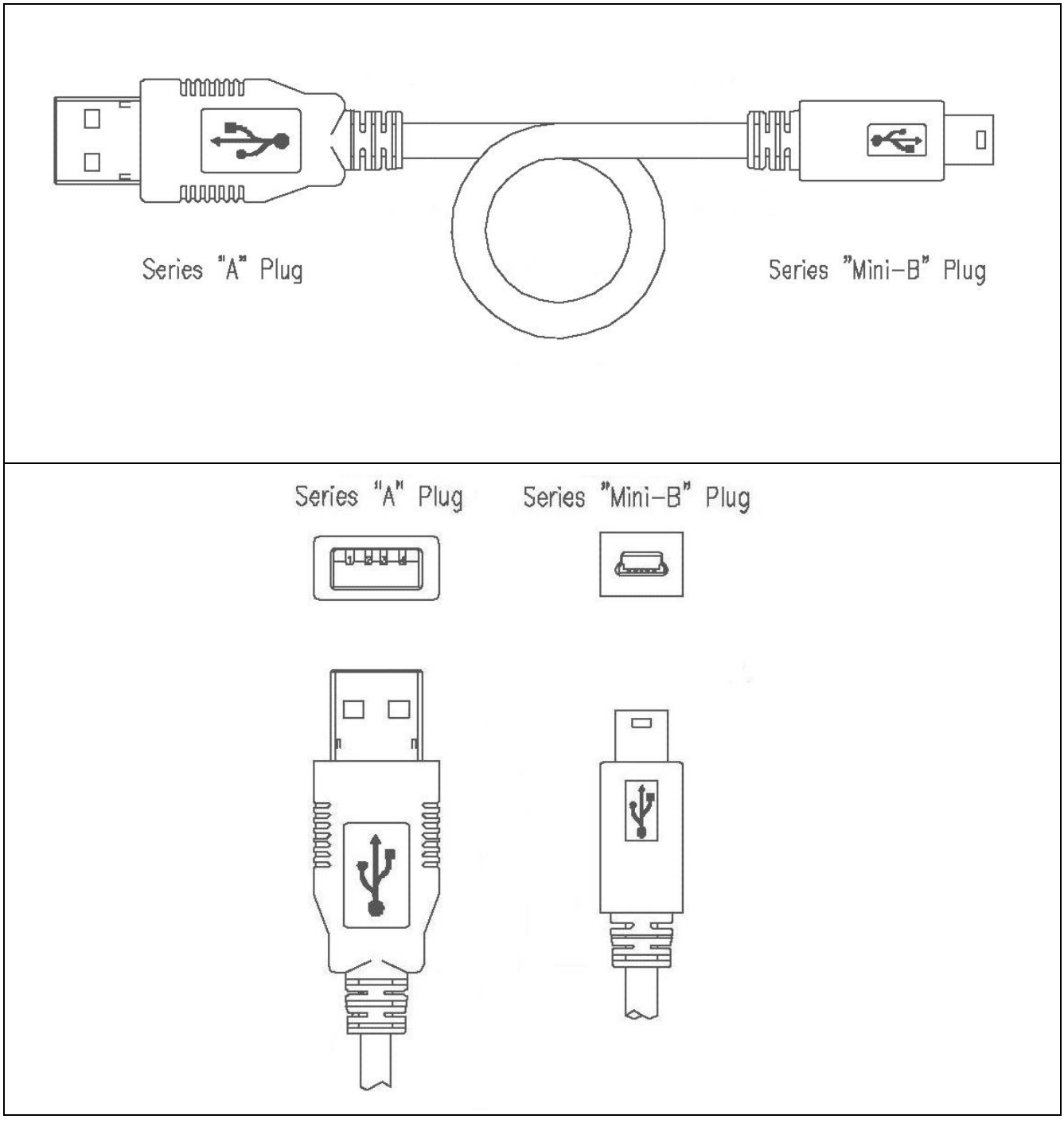


Figure 75: USB interface cable (Mini-B type)

14. Schematics

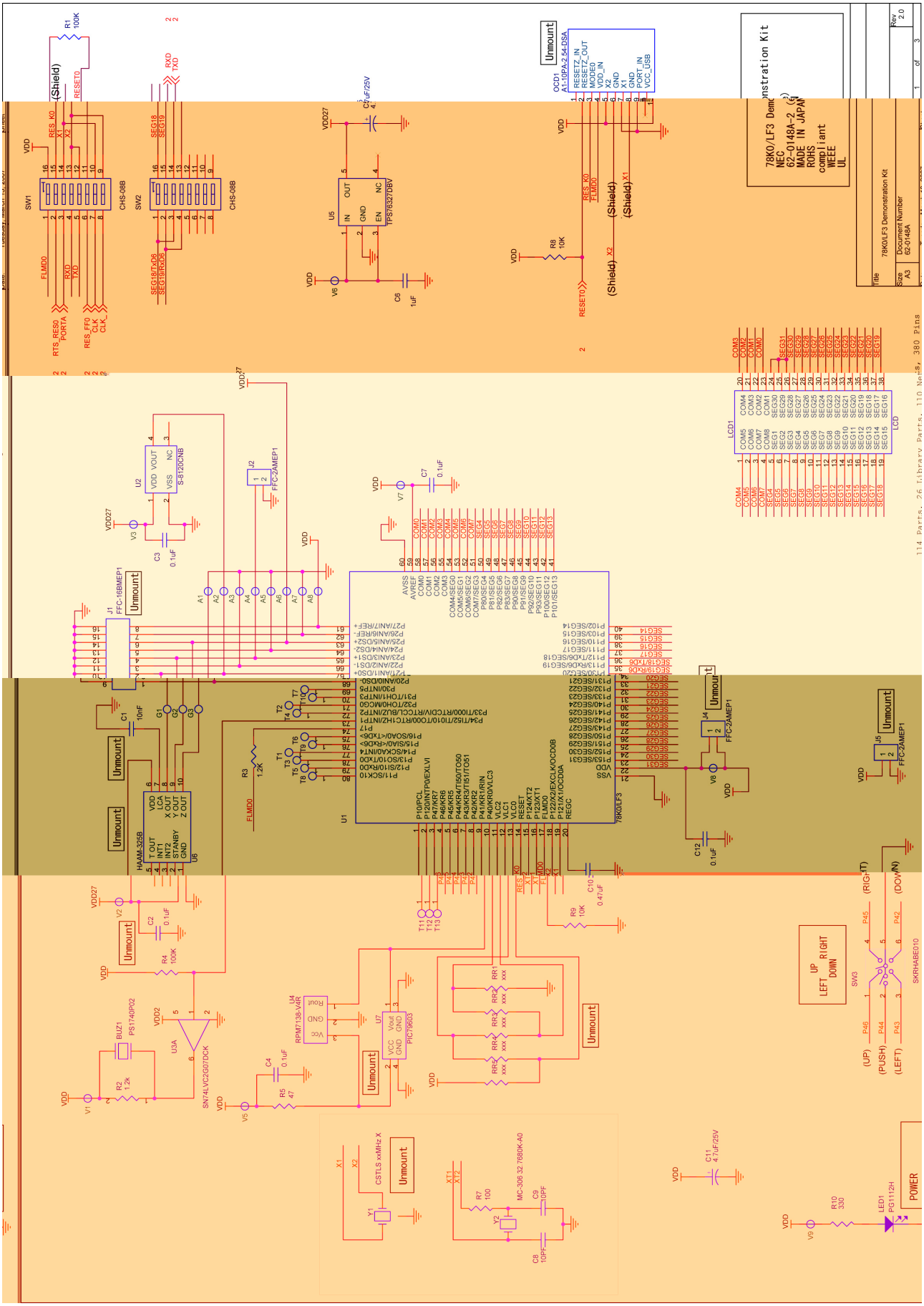


Figure 76: *78K0/Lx3 - See it!* schematics 1/2

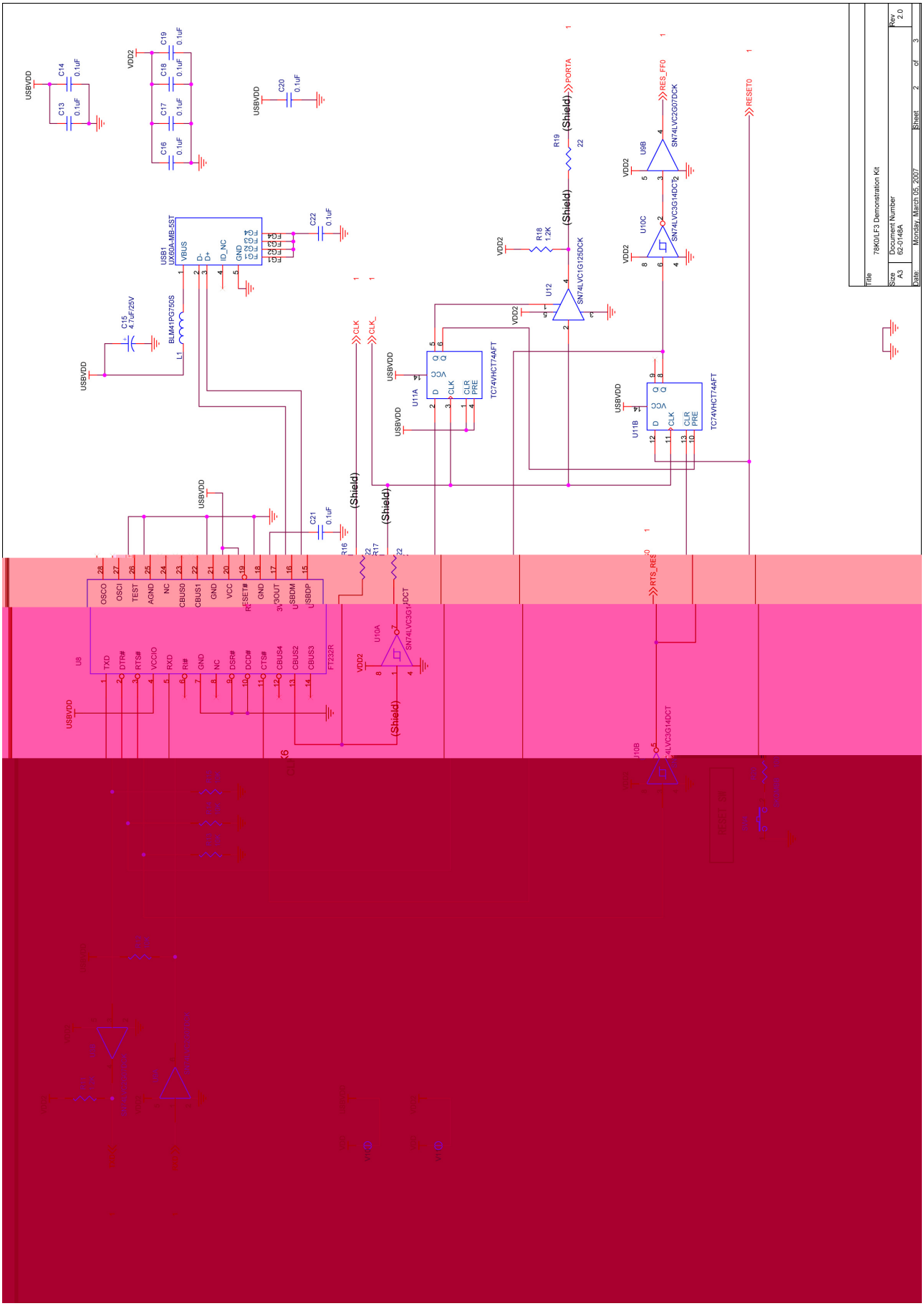


Figure 77: *78K0/Lx3 - See it!* schematics 2/2

[memo]